# 4.7 BIOLOGICAL RESOURCES – MARINE

This section describes existing marine habitat and plant and animal species in the proposed Cabrillo Port Project site and surrounding areas. Potential impacts on marine ecology from all phases of the proposed Project are identified and are addressed within this section. Key marine biological resource issues analyzed in this section include the presence of special status species (including marine mammals, sea turtles, seabirds, and fish) and potential impacts on species or habitats from Project construction and operational activities. Potential impacts include collision with or entanglement of marine mammals or sea turtles with Project vessels or moorings, introduction of anthropogenic noise to the marine environment, accidental fuel spills, direct impacts on hard bottom habitats or beach spawning areas, and impingement or entrainment of ichthyoplankton. This section also identifies measures to avoid or reduce the potential impacts and evaluates the effects of proposed alternatives on marine biological resources relative to the Project.

Comments relating to marine biological resources received during public scoping in March 2004, during the public review period for the October 2004 Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) and during the public review period for the March 2006 Revised Draft EIR are addressed in this section. Public concerns that were raised include potential liquefied natural gas (LNG) spills that may affect fish or other marine life; impingement and entrainment (entrapment) of fish or other marine organisms in seawater or cooling water intake systems; thermal pollution and lighting that may cause changes in marine mammal, sea turtle, marine bird, or fish behavior or cause harm to individuals of such species; disturbance of contaminated sediments that could potentially affect water quality and harm marine life and marine environments; potential impacts on marine life such as migrating whales caused by noise or entanglement during Project installation; noise impacts on marine mammals; and impacts on special status species and protected areas.

## 4.7.1 Environmental Setting

The Southern California Bight is an area about 30,100 square miles ($mi^2$) (78,000 square kilometers [$km^2$]) between Point Conception on the north, extending south to Ensenada, Baja California, encompassing the Mexican islands of Todos Santos and Los Coronados, and including the eight Channel Islands to the west. This area contains a variety of habitat types encouraging rich and varied marine life to thrive. The Channel Islands (eight major offshore islands), whose boundaries, for agency jurisdictional and management purposes, extend from mean high tide to a distance 6 nautical miles (NM) (6.9 miles or 11.1 km) offshore, provide additional habitats for marine organisms and serve as breeding grounds for many species of marine birds and marine mammals, including rocky coastline, and kelp beds (National Oceanic and Atmospheric Administration [NOAA] 2005). Between the populated mainland and the natural environments of the Channel Islands, a series of canyons, basins, and seamounts serve as additional habitat for these marine species. The unique physical and environmental features of this area, such as offshore wind patterns, currents, geology, and nutrient availability, provide for diverse and abundant ecological communities. The Southern

California Bight has a wide variety of uses, including recreation (boating, diving, and fishing), commercial uses (such as commercial fishing, oil and gas development), scientific research, and conservation areas.

### 4.7.1.1 Marine Benthic Communities: Invertebrates

#### Intertidal Benthic Communities

Marine benthic communities refer to bottom or seafloor dwellers. The terrestrial-marine interface represents a transition zone between fully terrestrial systems (see Section 4.8, “Biological Resources – Terrestrial”) and fully marine systems. This interface is characterized by species from both systems. The discussion below includes marine communities in the intertidal systems (sandy beaches and rocky shores) and in shallow subtidal areas frequently affected by wave and tidal action.

*Sandy Beaches*

Between 66 to 93 percent of the Southern California coastline comprises sandy beaches. Sandy beach communities generally support between 11 to 37 species, predominately crustaceans, mollusks, and polychaetes. Populations may range from 3,360 to 88,500 individuals per 3.3 feet (1 meter [m]) of beach, with the majority supporting an invertebrate biomass between 6.72 and 13.44 pounds per foot (10,000 and 20,000 grams per meter)(Dugan et al. 2000). Organisms that reside in this environment have adapted to its dynamic nature by being highly mobile, exhibiting tidal, semilunar, or seasonal patterns of movement. Invertebrates that inhabit sandy and nearshore beaches serve as food for fishes and shorebirds.

The invertebrate communities on a sandy beach can be correlated to slope, sand texture, and the presence of macrophyte wrack (organic debris, including kelp, algae, sea grasses, and marine organisms that wash up on the shoreline). This collection of detritus serves as a food source and protection from predators and desiccation (dehydration) for many marine organisms and seabirds. It supports a diverse fauna of insects and crustaceans, primarily beetles and kelp flies, talitrid amphipods, and isopods such as *Tylos punctatus*. Ormond Beach receives naturally low quantities of macrophyte wrack and thus supports a less diverse community of invertebrate species than do other Southern California beaches with high wrack input. Dugan et al. (2000) reported between 15 and 22 species of macrofaunal invertebrates from Ormond Beach.

On sandy beaches, each tidal zone (upper, middle, and lower) supports specific species of invertebrates. Common invertebrates in the upper intertidal zone include amphipods species in the genus *Orchestoidea*; the predatory isopod *Excirolana chiltoni;* and several species of polychaetes, e.g., *Excirolana chiltoni, Euzonus mucronata,* and *Hemipodus borealis*.

The middle intertidal zone is characterized by species such as the sand crab *Emerita analoga* and the polychaete *Nephtys californiensis*. Sand crabs are generally the most abundant of the common middle intertidal organisms, often comprising more than 99 percent of the individuals on a given beach (Dailey et al. 1993).

In the lower intertidal zone, polychaetes and nemerteans dominate. The large sand crab (*Blepharipoda occidentalis)*, the Pismo clam (*Tivela stultorum),* and the bean clam (*Donax gouldii*) are also found in the lower intertidal zone. *Tivela*, however, was once more abundant in the intertidal zone, and Pismo clam populations have been highly variable throughout the years and from beach to beach (Leet 2001).

*Rocky Shores*

Diverse assemblages of algae, invertebrates, and fish characterize California rocky intertidal areas. Rocky intertidal zones near the Project site are limited to breakwaters, piers, and jetties. These structures occur at the entrance to Port Hueneme, north of the Project shore crossing, but not in the immediate area surrounding the Project site.

*Kelp Beds*

Giant kelp (*macrocystis pyrifera*) is known to exist intermittently along the Southern California coast and provides important structure and habitat for numerous species of fish, invertebrates, birds, and marine mammals. Giant kelp generally lives on rocky substrates from depths of 20 to 98 feet (6.1 to 30 m), depending on water clarity. The lack of natural hard-bottom substrates at the proposed Project site at these depths would not provide suitable habitat for kelp beds. There are no known kelp beds or hard substrata habitat within or near the proposed Project site (Entrix 2003).

**Subtidal Benthic Communities**

Offshore subtidal benthic communities include infaunal communities occurring in soft substrata (sands and muds), and epifaunal communities on both hard and soft substrata. There are no known hard substrata subtidal benthic habitats at the Project site. Along the offshore pipeline routes, the sediments of the continental slope and basin floor consist predominantly of fine sands and muds. These soft substrate communities are described below. According to recent surveys of the proposed Project site, including pipeline routes to shore and the floating storage and regasification unit (FSRU) mooring location, no hard bottom habitats occur within the Project site (Fugro 2004).

*Infauna*

Bergen et al. (1998b) identified four major benthic infaunal assemblages (aggregations) based on cluster analysis of the macroinfaunal data. These assemblages consisted of a shallow water assemblage found between 32 feet to 105 feet (9.8 to 32 m) deep, an intermediate depth assemblage found between 105 to 377 feet (32 to 115 m) deep, a fine-sediment deep assemblage, and a coarse-sediment deep assemblage. Bergen et al. (1998b) found that depth was the dominant influence on community structure, with grain size exerting a secondary effect. A summary of the dominant species in each of the benthic infaunal assemblages on the continental shelf is provided in Table 4.7-1. The number of taxa and total abundance of organisms were greatest in the mid-depth habitat and lowest in the shallow habitat.

**Table 4.7-1 Average Abundance of Species (Organisms per Square Meter)**

| Species | Taxonomic Group | Deep Coarse | Deep Fine | Mid-Depth | Shallow |
|---|---|---|---|---|---|
| *Spiophanes missionensis* | Annelida | 386.0 | 195.0 | 563.2 | 132.2 |
| *Amphiodia digitata* | Ophiuroidea | 236.0 | | | |
| *Euphilomedes producta* | Arthropoda | 215.0 | | | |
| *Mediomastus* spp. | Annelida | 168.0 | 71.6 | 117.8 | 76.2 |
| *Chloeia pinnata* | Annelida | 100.0 | | | |
| *Amphiodia urtica* | Ophiuroidea | 83.0 | 263.2 | 422.0 | |
| *Spiophanes firnbriata* | Annelida | 82.0 | 149.7 | | |
| *Ampelisca careyi* | Arthropoda | 69.0 | 21.0 | | |
| *Photis lacia* | Arthropoda | 69.0 | | | |
| *Rhepoxynius bicuspidatus* | Arthropoda | 59.0 | | 43.0 | |
| Maldanidae[a] | Annelida | 51.0 | 91.5 | 105.0 | 127.9 |
| *Pectinaria califomiensis* | Annelida | 50.0 | 91.1 | 85.3 | |
| *Eudorella pacifica* | Arthropoda | 35.0 | | | |
| *Lumbrineris* spp. | Annelida | 35.0 | 94.0 | 50.8 | 57.5 |
| *Paraprionospio pinnata* | Annelida | 33.0 | 47.8 | 45.4 | 108.9 |
| *Euclymeninae* sp. A | Annelida | 31.0 | | 28.2 | |
| *Decamastus gracilis* | Annelida | 21.0 | | | |
| *Terebellides califomica* | Annelida | | 23.0 | 20.2 | |
| *Maldane sarsi* | Annelida | | 34.0 | | |
| *Levinsenia* spp. | Annelida | | 30.3 | | |
| *Cossura* spp. | Annelida | | 26.9 | | |
| *Laonice appelloefi* | Annelida | | 21.8 | | |
| *Sthenelanella uniformis* | Annelida | | | 84.2 | |
| *Phoronis* sp. | Phoronida | | | 77.9 | |
| *Prionospio* sp. A | Annelida | | | 76.4 | |
| *Ampelisca brevisimulata* | Arthropoda | | | 50.2 | 31.6 |
| *Euphilomedes carcharodonta* | Arthropoda | | | 47.5 | |
| *Paramage scutata* | Annelida | | | 46.4 | |
| *Parvilucina tenuisculpta* | Mollusca | | | 44.0 | |
| *Leptochelia dubia* | Arthropoda | | | 42.3 | |
| *Heterophoxus oculatus* | Arthropoda | | | 37.6 | |
| *Pholoe glabra* | Annelida | | | 28.0 | |
| *Glycera nana* | Annelida | | | 26.7 | |
| *Tellina carpenteri* | Mollusca | | | 24.4 | |
| *Gnathia crenulatifrons* | Arthropoda | | | 24.2 | |
| *Tubulanus polymorphus* | Nemertea | | | 23.2 | |

**Table 4.7-1 Average Abundance of Species (Organisms per Square Meter)**

| Species | Taxonomic Group | Deep Coarse | Deep Fine | Mid-Depth | Shallow |
|---|---|---|---|---|---|
| *Ampelisca pugetica* | Arthropoda | | | 22.2 | |
| *Amphideutopus oculatus* | Arthropoda | | | | 132.9 |
| *Glottidia albida* | Brachiopoda | | | | 90.3 |
| *Spiophanes bombyx* | Annelida | | | | 82.6 |
| *Ampelisca cristata* | Arthropoda | | | | 65.1 |
| *Macoma yoldiformis* | Mollusca | | | | 54.8 |
| *Tellina modesta* | Mollusca | | | | 50.8 |
| *Apoprionospio pygmaea* | Annelida | | | | 50.0 |
| *Owenia collaris* | Annelida | | | | 44.7 |
| *Amphicteis scaphobranchiata* | Annelida | | | | 24.8 |
| *Carinoma mutabilis* | Nemertea | | | | 24.3 |
| *Ampharete labrops* | Annelida | | | | 23.4 |
| *Rhepoxynius menziesi* | Arthropoda | | | | 22.2 |
| Lineidae | Nemertea | | | | 20.3 |

*Source*: Bergen et al. 1998b.
*Note :*
[a]All Maldanids except 11 identified species.

### *Epifauna*

Epifaunal mega-invertebrate populations varied significantly by region, depth, and proximity to outfalls. Three regions were identified: the northern region (Point Conception to Point Dume), the central region (Point Dume to Dana Point), and the southern region (Dana Point to Mexico). Depth intervals considered included the inner shelf (33 to 82 feet [10 to 25 m]), the middle shelf (82 to 328 feet [25 to 100 m]) and the outer shelf (328 to 656 feet [100 to 200 m]).

In the deep basins of the Southern California Bight, the biological community shows a dramatic change in species composition and structure. According to Thompson et al. (1993), the floor of the Santa Monica Basin (2,345 to 2,880 feet [715 to 878 m] in depth) is largely devoid of macrofauna, with live organisms collected from approximately only 26 percent of the sites sampled. About eight species of megafaunal animals have been collected from the floor of the Santa Monica Basin. The dominant species are the galatheid crabs *Munida quadrispinosa* and *Munidopsis hysterix* (Thompson et al. 1993).

### *Special Status Invertebrate Species*

#### <u>White Abalone (Haliotis sorenseni) – Federal Endangered</u>

The white (Sorensen's) abalone usually occurs at depths from 66 to 200 feet (20 to 61 m) (Hobday and Tegner 2000), although some have been found in water as shallow as

15 feet (4.6 m) (Cox 1962; Howorth 2006). California Department of Fish and Game (CDFG) landings data indicate that 0.29 percent of the total white abalone landings between 1955 and 1993 came from locations between Pt. Conception and Pt. Dume (Hobday et al. 2001). In addition, at least two white abalone have been identified in shallow waters (5-10 m deep) off the coast of Santa Barbara County (NOAA 2006). However, considering the lack of suitable hard substrate to which abalone could attach and the algae upon which they feed, the possibility of the presence of white abalone in the project area is extremely remote. Therefore, the mooring and anchoring of the FSRU, the construction of the offshore pipelines, and the operations of the FSRU may affect, but would likely not adversely affect abalone.

### 4.7.1.2 Marine Fishes

#### Common Marine Fish Species

Distribution and abundance of fish species can be strongly influenced by substrate, depth, and seasonal, annual, and decadal changes in water temperature, including El Niño events. Fish species distribution and diversity can also be influenced by anthropogenic factors. For example, overfishing on a global basis has resulted in general declines in diversity that are noticeable within coastal ecosystems worldwide as a result of the examination of historical trends (Jackson et al. 2006).

The sandy or muddy intertidal areas are home to leopard sharks, rays, croakers, mullet, and surfperches (Leet et al. 2001). In the sandy or muddy shallow subtidal habitats, sportfishes including surfperches, California corbina, California halibut, sanddabs, yellowfin croakers, and young white seabass are common (Leet et al. 2001). Deep soft sediment areas are home to a wide variety of fishes, including rockfishes, flatfishes, and shrimp.

Fishes common to the vicinity of the Project vary according to water depth, dominant substrate, and habitat. Habitats vary from the narrowly distributed shoreline to open water areas to waters more than 2,900 feet (884 m) adjacent to the FSRU. Common fishes in the Southern California Bight are described in Table 4.7-2.

#### Special Status Marine Fish Species

Special status species are those designated under a Federal or State law or regulation to be threatened or endangered or considered by the scientific community to be rare enough to require special management or protection. The special status species discussed below have been identified as potentially occurring or potentially having habitat within or near the Project site.

**Table 4.7-2 Fish Species Common to the Project Vicinity**

| Common Name | Scientific Name | Soft Bottom 0 to 82 feet (0 to 25 m) | Soft Bottom > 82 feet (> 25 m ) | Hard Bottom 0 to 82 feet (0 to 25 m)[a] | Hard Bottom > 82 feet (> 25 m)[a] |
|---|---|---|---|---|---|
| Bass, barred sand | *Paralabrax nebulifer* | X | X | | |
| Bass, kelp | *Paralabrax clathratus* | | | X | X |
| Bass, spotted bay | *Paralabrax maculatofasciatus* | X | X | X | X |
| California corbina | *Menticirrhus undulatus* | X | | | |
| Cowcod | *Sebastes levis* | | X | | X |
| Croaker, yellowfin | *Umbrina roncador* | X | X | | |
| Croaker, white | *Genyonemus lineatus* | X | X | | |
| Garibaldi | *Hypsypops rubicundus* | | | X | |
| Grunion, California | *Leuresthes tenuis* | X | | | |
| Guitarfish, shovelnose | *Rhinobatos Productus* | X | | | |
| Halibut, California | *Paralichthys californicus* | X | X | | |
| Halfmoon | *Medialuna californicus* | | | X | X |
| Opaleye | *Girella nigricans* | | | X | X |
| Ray, bat | *Myliobatis californica* | X | X | | |
| Rockfish, black | *Sebastes melanops* | X | X | X | X |
| Rockfish, blue | *Sebastes mystinus* | | | X | X |
| Rockfish, bocaccio | *Sebastes paucispinus* | X | X | X | X |
| Rockfish, calico | *Sebastes dalli* | | X | | X |
| Rockfish, kelp | *Sebastes atrovirens* | | | X | X |
| Sanddab, Pacific | *Citharichthys sordidus* | | X | | |
| Sanddab, speckled | *Citharichthys stigmaeus* | X | X | | |
| Scorpion fish, California | *Scorpaena guttata* | X | X | X | X |
| Seabass, white | *Atractoscion nobilis* | X | X | X | X |
| Shark, leopard | *Triakis semifasciata* | X | | | |
| Sheepshead, California | *Semicossyphus pulcher* | | | X | X |
| Sole, Dover | *Microstomus pacificus* | | X | | |
| Sole, petrale | *Eopsetta jordani* | | X | | |
| Surfperch spp. | *Embiotocidae* | X | | | |
| Thornyhead spp. | *Sebastolobus* spp. | | X | | X |

*Source*: Leet et al. 2001.
*Note*:
[a] Hard bottom substrates and habitats are not known to exist in the Project site.

Bocaccio (*Sebastes paucispinis*) is one of many species considered important to California fisheries. Bocaccio is a long-lived species that has undergone, by some estimates, a 90 percent decline over the past several decades (Musick 1999). Adults are typically found on rocky bottoms or other structures that provide topographical relief at depths of 39 to 1,578 feet (12 to 481 m) and most abundantly at depths of 164 to 823 feet (50 to 251 m). Larvae and small juveniles are pelagic and commonly occur in the upper 295 feet (90 m) of the water column. Juveniles sometimes form dense schools under drifting kelp mats (NMFS 2002). Juveniles take approximately five years to mature into adulthood and may live up to 40 years (NMFS 2002). It is thought that the large old fish may contribute most importantly to reproductive success (Garrison 2002).

The number of many species of Pacific rockfish (Sebastes spp.) has declined dramatically over the past two decades within the Southern California Bight (Caselle et al. 2001, Musick 1999). Many of these species are being considered for listing under the Federal and State Endangered Species Acts.

California grunion (Leuresthes tenuis) is considered “biologically and recreationally significant” by the (CDFG (Fluharty 2001). The principal range of the grunion is between Point Conception in Southern California and Punta Abreojos in Baja California, Mexico. However, there are small populations both north and south of these points. Occasionally, grunion may appear in fair numbers as far north as Morro Bay, California, and spawning has been reported as far north as Monterey Bay, California.

Grunion inhabit the nearshore waters to a depth of about 40 feet (12.2 m) and spawn along sandy beaches (CDFG 2005). Grunion “runs” or spawning occurs in Southern California from March through September (CDFG 2005) with most spawning occurring in April and May (Fluharty 2001). Juvenile grunion school in shallow water a few miles from shore.

*Steelhead (Oncorhynchus mykiss) – Federal Endangered*

The steelhead is a seagoing rainbow trout that spawns in freshwater streams. The hatchlings migrate to the open ocean, where they mature before returning to freshwater to spawn. Spawning typically occurs from December to May.

NOAA Fisheries identified 15 evolutionarily significant units (ESU) of *O. mykiss* within its Pacific range. The Southern California steelhead ESU is listed as endangered under the Endangered Species Act (ESA), and includes all naturally spawned populations of steelhead (and their progeny) in streams from the Santa Maria River to Malibu Creek, California (inclusive). The Southern California steelhead ESU is further discussed in Section 4.8.

**Essential Fish Habitat**

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), established procedures designed to identify, conserve, and enhance Essential Fish Habitat (EFH) for those species regulated under a Federal fisheries management plan. The Magnuson-Stevens

Fishery Conservation and Management Act and the Sustainable Fisheries Act require councils to include descriptions of EFH in all Federal fishery management plans (FMPs). This EIS/EIR also serves as an EFH assessment. Regulations related to EFH are discussed in Section 4.7.2, and Project impacts related to EFH are discussed in Section 4.7.4 under Impact BioMar-3, “EFH Assessment.”

### 4.7.1.3 Plankton

Plankton are tiny (sometimes microscopic) organisms that occur in the water column and have either limited or no swimming ability. They generally drift or float with the ocean currents and upwelling cycles. Phytoplankton form the base of the food chain and are typically unicellular or colonial algae that photosynthesize organic matter and carbon dioxide using light. They are generally limited to the areas near the surface where light can penetrate the water. Zooplankton can spend their entire life cycle as plankton (holoplankton) or spend a portion of their life cycle as plankton (meroplankton). Zooplankton can occur throughout the water column from surface to bottom and may exhibit diurnal migrations. Ichthyoplankton (fish eggs and larvae) are a major component of the zooplankton community. The distribution of ichthyoplankton near shore are influenced by spawning habits of demersal fish species, while further offshore, composition and distribution are influenced by pelagic and migratory species, currents and upwelling in the area, and several other environmental factors. Ichthyoplankton species within the water column are naturally influenced by their physical environment (water temperature, salinity, current direction, speed, etc.) as well as biological factors (life stage, prey-predator relationships, etc.). Seasonal changes to densities also occur depending on spawning cycles for individual species. Additionally, vertical migration within the water column can occur in response to such factors as light penetration, food sources, and predator presence. All of these factors determine the density of a particular species in a specific location at a specific point in time.

A consultation and literature search was performed through the California Cooperative Oceanic Fisheries Investigations (CalCOFI) as well as other literature sources to identify data regarding the vertical distributions of ichthyoplankton species within the Southern California Bight. CalCOFI samples collected offshore near (surrounding) the Project site indicated that densities were highest from January to March. A detailed table containing vertical distribution data for species found in the literature review is provided in the ichthyoplankton analysis (Appendix H1). Based on the findings, it is noted that individual species occur at various depths and exhibit widely varied migrations patterns in the water column. Generally, ichthyoplankton can occur in the water column from the surface to depths of over 300 m (984 feet) (Moser et al, 1993; Moser et. al 1999; Moser et al. 1997; Schlotterbeck et. al 1982; Sakuma et. al 1999). The ichthyoplankton analysis provided in Appendix H1 was prepared by Ecology and Environment, Inc. based on available data obtained from the CalCOFI sampling stations surrounding the Project site, which is the best available data within the proposed Project site.

### 4.7.1.4 Conservation Areas and Research Programs

**Cowcod Conservation Area**

At its closest point, the proposed Project is approximately 1.52 NM (1.75 miles or 2.8 km) outside of the northern boundary of the California Cowcod Conservation Area. The Cowcod Conservation Area was identified as part of the rebuilding plan developed by the Pacific Fishery Management Council (PFMC) in accordance with the National Standard Guidelines for the Magnuson-Stevens Act and in response to the cowcod (*Sebastes levis*) assessment conducted by NOAA Fisheries and the CDFG. The PFMC determined that the cowcod resource was over-fished, and as part of a rebuilding strategy developed a rebuilding plan for cowcod and other rockfish and identified crucial habitat off the San Diego coast of Southern California (Pacific Fisheries Management Council 2003b).

**Marine Protected Areas, Channel Islands National Marine Sanctuary**

At the closest point, the proposed FSRU lies within 12.61 NM (14.5 miles or 23.4 km) of the Channel Islands National Marine Sanctuary (CINMS). The closest distance from the CINMS to the proposed pipelines is 7.2 NM (8.29 miles or 13.33 km). The CINMS encompasses approximately 1,243 square NM (1,646 $mi^2$ or 4,263 $km^2$) of the waters surrounding the four northern Channel Islands and Santa Barbara Island. It extends from mean high tide to 6 NM (6.9 miles or 11.1 km) offshore of each of the islands.

Commercial and sport fishing activities are allowed within the Sanctuary, subject to CDFG regulations. However, ten marine protected areas have been established within the State waters of the CINMS. No take of marine organisms is allowed within these marine protected areas. In addition, two marine conservation areas have also been established. Limited recreational and/or commercial fishing is allowed within these areas.

The CINMS was designated as a Sanctuary under the authority of the Marine Protection, Research, and Sanctuaries Act of 1972. The proposed Project activities are not inconsistent with the designation language (Federal Register 1980). The CINMS sustains multiple uses that include natural resource management and conservation; recreational uses such as fishing, diving and boating; and valuable commercial industries such as offshore oil and gas development, offshore oil and gas structures, desalination plants, and various ports and harbors. The NOAA National Ocean Service's National Marine Sanctuaries Program is the Federal office responsible for implementing the National Marine Sanctuaries Act. In addition, the National Marine Sanctuaries Program and National Ocean Service's Office of Ocean and Coast Resource Management are involved in a number of interagency working groups and initiatives at the local, regional, State, national, and international levels. The Office of Ocean and Coast Resource Management, through the Coastal Zone Management Act, implements the National Coastal Management Program, which protects the area's resources, promotes wise use of the valuable resources of the shorelines, and seeks a balance between preservation and healthy economic development.

The United Nations Educational Scientific and Cultural Organization (UNESCO) lists the Channel Islands as a Biosphere Reserve (UNESCO 2006). The U.S. Public Lands Information Center, which works in partnership with the Bureau of Land Management, the USDA Forest Service, and the U.S. Fish and Wildlife Service to provide interpretive and educational resources to the public, states the following: "Biosphere Reserve" is an international designation for protected, natural environments where conservation is combined with the sustained economic use of natural resources. Each biosphere reserve represents a specific ecosystem and a place where government policy makers, scientists, and local people cooperate to manage land and water resources to meet human needs while conserving natural resources. In the United States, the designation of sites is voluntary...Neither "biosphere preserve" nor "world heritage site" designations place US public lands in any kind of a United Nations land use program. Nor do these designations create United Nations reserves in the United States. America's public lands still belong to the people of the United States (U.S. Public Lands Information Center 2006).

The CINMS is currently undergoing a process to update its Management Plan, and the Draft Management Plan and Draft EIS (DMP/DEIS) was released in May 2006 (U.S. Department of Commerce 2006). The DMP/DEIS "does not propose a sanctuary boundary expansion, but calls for the continuation of a comprehensive, scientifically-based, open public process that will lead to a decision in the future" (Carretta et al. 2005). A study area that expands the Sanctuary's current boundaries was established for the management plan process. Including the no-action alternative, six boundary expansion alternatives, known as "working boundary concepts," are being considered. The CINMS has developed a biogeographical assessment of the marine fauna in and around the CINMS. The assessment gathered existing comprehensive and spatially explicit biological and environmental data from all available sources. The results of this work will be used to identify marine resource patterns, trends, distribution, and regionally potentially important ecological areas and time periods (Caldow 2005). The analysis of the alternative CINMS boundaries will be provided within a Supplemental EIS.

Depending on the CINMS boundary selected, the proposed deepwater port (DWP) may or may not be within the revised boundaries of the Sanctuary. The CINMS has been consulted regarding the proposed Cabrillo Port Project and is a reviewing agency for documents prepared under the National Environmental Policy Act (NEPA)/California Environmental Quality Act (CEQA) process. A number of commercial facilities currently exist within the CINMS boundaries and, according to CINMS staff, installation of the FSRU and pipeline at the proposed location is not inconsistent with the Sanctuary and would not automatically preclude the CINMS from including the Project site in the new Sanctuary boundaries. However, this would be considered by the CINMS when making a final decision (Mobley 2004) together with the results of the biogeographical assessment.

### California Oceanic Cooperative Fisheries Investigations

CalCOFI is a partnership of the CDFG, NOAA Fisheries, and the Scripps Institution of Oceanography, which studies the marine environment off the coast of California and the management of its living resources. Currently, two- to three-week cruises are conducted quarterly on a grid of 66 stations off Southern California. At each station, physical and chemical measurements are made to characterize the environment and map the distribution and abundance of phytoplankton, zooplankton, and fish eggs and larvae. Although some of these stations exist near the proposed Project site (the nearest is located approximately 12.47 NM [14.35 miles or 23.1 km] from the FSRU), no impact on the CalCOFI research or the 66 research stations is expected.

### Coastal Wetlands

Ormond Beach has been designated a priority site for preservation and restoration under the Southern California Wetlands Recovery Project of the California Coastal Conservancy. Historically, extensive estuarine wetlands systems once existed on the coast of Oxnard; however, most of this wetland complex has since been destroyed by development. South Ormond Beach is one of the few remaining pieces that are still relatively unmodified. The system is severely degraded, and restoration projects propose restoration of tidal water flow to South Ormond Beach (California Coastal Conservancy 2004). A detailed discussion of wetlands near the Project site and any potential impacts and mitigation measures is provided in Section 4.8, "Biological Resources – Terrestrial."

## 4.7.1.5 Marine Mammals

All marine mammals are protected under the Marine Mammal Protection Act (MMPA). Several species of threatened or endangered marine mammals potentially occur within or near the Project site. All species reported in the region are discussed below, with non-listed species first followed by separate discussions for threatened and endangered species.

### Habitats

Marine mammals are wide-ranging, occupying numerous habitats with distinct bathymetric features, many of which are not present at or near the Project site. Escarpments, characterized by upwelling and vigorous food production, are particularly attractive to many marine mammal species. The greatest abundance and diversity of marine mammals in the region occur around the escarpments surrounding the Channel Islands. Thus, although marine mammal species are abundant and diverse in the general region, they are much less prolific in the offshore areas surrounding the Project site.

### Taxa

Marine mammals discussed in this section represent the order *Cetacea*, which includes 34 species of whales, dolphins, and porpoises; the order *Pinnipedia*, which includes seven species of seals and sea lions; and the family *Mustelidae*, which includes only the southern sea otter *(Enhydra lutris nereis*). Six species of cetaceans are federally listed as endangered (sei whale, blue whale, fin whale, humpback whale, north Pacific right whale, and sperm whale). Two species of pinnipeds (Guadalupe fur seal and Steller sea lion) and the southern sea otter (*Mustelidae*) are considered threatened.

*Cetacean*s

The occurrence of non-listed species of cetaceans, including *Mysticetes* (baleen whales) and *Odontecetes* (toothed whales, dolphins, and porpoises) in the region and near the Project site is summarized on Table 4.7-3. Brief species accounts are also provided below.

**Table 4.7-3 Occurrence of Protected Species of Cetaceans in or near the Project Site**

| Species | Federal Protected Status other than under MMPA | Population or Stock Size | Occurrence in Southern California Bight | Potential Occurrence in Project Area |
|---|---|---|---|---|
| **Mysticeti** | | | | |
| Sei whale | Federal endangered | 56 | Extremely rare; not reported near Project site | Extremely remote |
| Blue whale | Federal endangered | 1,744 | Seasonally abundant along escarpments; not reported near FSRU, but may occur near LNG carrier approach routes | Unlikely at FSRU, but may occur near LNG carrier approach routes |
| Fin whale | Federal endangered | 3,279 | Uncommon; reported near Project site | Unlikely at FSRU, but may occur near LNG carrier approach routes |
| Humpback whale | Federal endangered | 1,391 | Seasonally abundant along escarpments; reported near Project site | Unlikely at FSRU, but may occur near LNG carrier approach routes |
| North Pacific right whale | Federal endangered | Not available | Extremely rare; not reported near Project site | Extremely remote |
| Bryde's whale | None | 12 | Extremely rare; not reported near Project site | Extremely remote |
| Minke whale | None | 1,015 | Uncommon; reported near Project site | Unlikely; very low numbers |
| California gray whale | None | 18,178 | Common seasonally; reported near Project site | Likely December through May |
| **Odontecetes** | | | | |
| Sperm whale | Federal endangered | 1,233 | Rare; not reported near Project site | Extremely remote |
| Short-beaked common dolphin[a] | None | 449,846 | Abundant; reported near Project site | Likely |
| Long-beaked common dolphin[a] | None | 43,360 | Abundant; reported near Project site | Likely |

**Table 4.7-3 Occurrence of Protected Species of Cetaceans in or near the Project Site**

| Species | Federal Protected Status other than under MMPA | Population or Stock Size | Occurrence in Southern California Bight | Potential Occurrence in Project Area |
|---|---|---|---|---|
| Bottlenose dolphin: coastal stock | None | 206 | Common; low numbers; reported near Project site | Likely within 0.6 mile (1 km) of shore; small numbers and sporadic |
| Bottlenose dolphin offshore stock | None | 5,065 | Locally abundant; not reported near Project site | Unlikely |
| Pacific white-sided dolphin | None | 59,274 | Sporadically abundant; cold water; reported near Project site | Unlikely |
| Northern right whale dolphin | None | 20,362 | Sporadically abundant; cold water; not reported near Project site | Unlikely |
| Risso's dolphin | None | 16,066 | Locally abundant; reported near Project site | Possible |
| Killer whale (both stocks) | None | 346 (transient); 466 (offshore) | Uncommon; reported near Project site | Unlikely |
| Short-finned pilot whale | None | 304 | Uncommon; not reported near Project site | Extremely remote |
| False killer whale | None | Not available for Southern California Bight | Rare; not reported near Project site | Extremely remote |
| Spotted dolphin | None | Not available for Southern California Bight | Rare; not reported near Project site | Extremely remote |
| Striped dolphin | None | Not available for Southern California Bight | Rare; not reported near Project site | Extremely remote |
| Long-snouted spinner dolphin | None | Not available for Southern California Bight | Rare; not reported near Project site | Extremely remote |
| Rough-toothed dolphin | None | Not available for Southern California Bight | Rare; not reported near Project site | Extremely remote |
| Dall's porpoise | None | 99,517 | Sporadically abundant; cold water; reported near Project site | Possible |
| Harbor porpoise | None | 1,656 | Rare; not reported near Project site | Remote |
| Baird's beaked whale | None | 228 | Rare; not reported near Project site | Extremely remote |
| Cuvier's beaked whale | None | 1,884 | Uncommon; not reported near Project site | Extremely remote |
| Hubb's beaked whale | None | 1,247 combined with others | Rare; not reported near Project site | Extremely remote |

**Table 4.7-3 Occurrence of Protected Species of Cetaceans in or near the Project Site**

| Species | Federal Protected Status other than under MMPA | Population or Stock Size | Occurrence in Southern California Bight | Potential Occurrence in Project Area |
|---|---|---|---|---|
| Blainville's beaked whale | None | 1,247 | Rare; not reported near Project site | Extremely remote |
| Gingko-toothed whale | None | 1,247 combined with others | Rare; not reported near Project site | Extremely remote |
| Perrin's beaked whale[b] | None | 1,247 combined with others | Rare; not reported near Project site | Extremely remote |
| Stejneger's beaked whale | None | 1,247 combined with others | Rare; not reported near Project site | Extremely remote |
| Pygmy sperm whale | None | 247 | Rare; not reported near Project site | Extremely remote |
| Dwarf sperm whale | None | Not available | Rare; not reported near Project site | Extremely remote |

*Sources*: Carretta et al. 2005; Angliss and Outlaw 2005.

*Notes*:

[a] The short- and long-beaked common dolphins were once considered a single species; thus, earlier surveys may have reported only *Delphinus delphis* near the area.

[b] Formerly reported as Hector's beaked whale (*Mesoplodon hectori*).

## Mysticetes

The suborder *Mysticeti*, comprising the baleen whales, is represented by eight species, five of which are federally listed as endangered (sei whale, blue whale, fin whale, humpback whale, and north Pacific right whale). The remaining three species include Bryde's whale (*Balaenoptera edeni*), the minke whale (*B. acutorostrata*), and the California gray whale (*Eschrichtius robustus*), which was delisted in 1993 after its population recovered (Rugh et al. 1999). Non-threatened and non-endangered species are described below. The five federally listed Mysticetes are described below under "Special Status Species."

Bryde's whale is a subtropical-to-tropical species that has been reported only twice in the Southern California Bight (Barlow 1995; Forney et al. 1995; Barlow and Gerrodette 1996; Howorth 2006). The California-Oregon-Washington stock size is estimated at 12 individuals (Carretta et al. 2005). Considering these factors, the chances of it appearing at or near the Project site are extremely remote.

The California-Oregon-Washington stock of minke whales is estimated at 1,015 individuals (Carretta et al. 2005). Minke whales are most abundant in spring and summer in the Southern California Bight (Dohl et al. 1981), perhaps entering the region from the south and offshore. Most sightings are of individual animals, although two to five whales are sometimes reported. Sightings of this species are infrequent and appear to have diminished over the years. It is unlikely that minke whales would be encountered at or near the Project site, but if so, they would be encountered in the numbers indicated above.

California gray whales migrate annually from their winter breeding and calving grounds in the lagoons of Baja California, Mexico, to their summer feeding grounds in Alaska. In the Southern California Bight, the southbound migration generally begins in December and ends in mid-February, with a few southbound individuals appearing as early as late October or as late as April. The northbound migration within the Southern California Bight begins in mid-February and ends in May, with rare stragglers in the summer months. Although comparatively more individuals hug the coast on the route north, the majority of animals during both migrations favor the Channel Islands rather than the mainland coast along the Southern California Bight (Carretta et al. 2000; SAIC 2003).

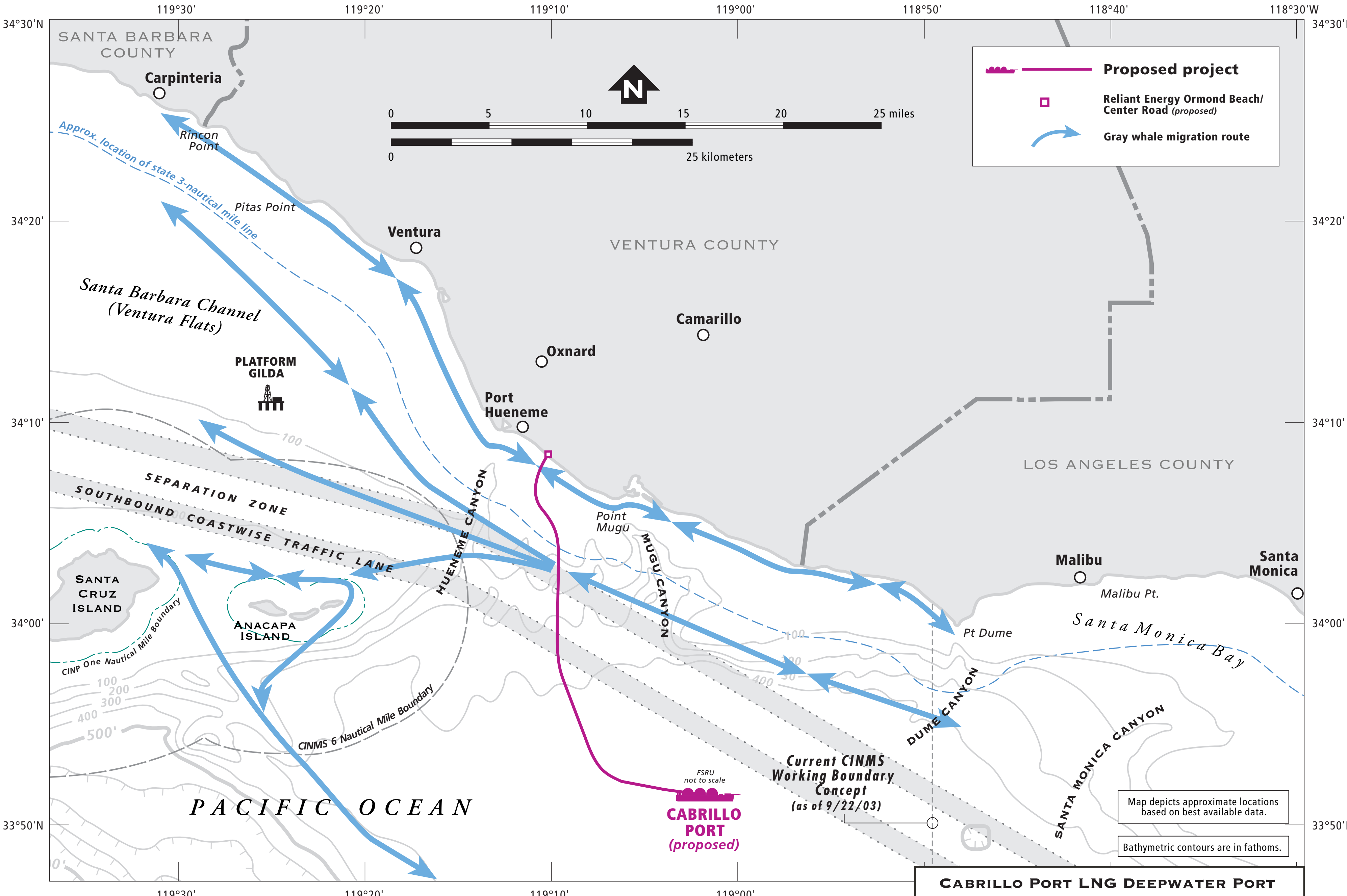
Several migration corridors exist near the Project site and are depicted in Figure 4.7-1. The migration routes depicted have been developed from numerous sources (Hill and Barlow 1992; Lee 1993; Carretta and Forney 1993; Forney et al. 1995; Carretta et al. 2000), including recent anecdotal information from commercial vessel and whale watch operators in the region (Howorth 2005). The fidelity of California gray whales to these migration corridors is extremely well-known (Rugh et al. 1999; Sheldon et al. 2002). To the south, one corridor leads from Santa Catalina Island along an escarpment southwest of the Santa Monica Basin to Anacapa and the Santa Cruz islands. This corridor passes offshore of the proposed FSRU location. One inshore track hugs the coast the entire way, with individuals remaining just outside the surf to up to 1 NM (1.2 miles or 1.9 km) offshore. At least one other track appears to follow the bathymetric contours just inshore of the Northbound Coastwise Traffic Lane. This track appears to diverge as it enters the Anacapa Passage, northwest of the Project site.

The main track continues just inshore from the Northbound Coastwise Traffic Lane and immediately seaward of Platforms Gail and Grace. This track branches, however, with one fork stretching across the broad alluvium of what is colloquially known as the Ventura Flats. This track ranges from 60 to 150 feet (18.3 to 46 m) in depth, converging within 2 to 3 NM (2.3 to 3.5 miles, or 3.7 to 5.6 km) offshore off Coal Oil Point, northwest of Santa Barbara. Another branch may extend along the north shore of the northern Channel Islands, joining one of the branches of the track offshore of the FSRU area. Gray whales may be encountered periodically at or near the Project site, at least from December through May.

<u>Odontocetes</u>

*Odontocetes*, comprising toothed whales, dolphins, and porpoises, are represented by 26 species, only one of which is federally listed as endangered (sperm whale). Of these, 14 are oceanic dolphins (see Table 4.7-3 above). Five of these species are tropical and subtropical in distribution and have only rarely been reported in the Southern California Bight. Thus, the chances of their appearing at or near the Project site are extremely remote. Of the remaining species, the killer whale (*Orcinus orca*) appears sporadically in the Southern California Bight. Although its presence is unlikely, it could occur during the northbound migration of gray whales. Species descriptions for non-threatened and non-endangered species are given below. A species description for the sperm whale, the one federally listed odontocete, follows Table 4.7-5 below.

References: Howorth, 2004 and Carretta et al, 2000






**CABRILLO PORT LNG DEEPWATER PORT**

Figure 4.7-1

**Gray Whale Migration Routes**

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The Pacific white-sided dolphin (*Lagenorhynchus obliquidens*), associated with cooler waters, sometimes appears in late spring and summer, often with humpback whales (*Megaptera novaeangliae*), which generally appear along the escarpment north of the northern Channel Islands. The northern right whale dolphin (*Lissodelphis borealis*) could appear in the region during cold water periods in spring and early summer, although it has not been reported at or near the project site during any of the surveys cited in Carretta et al. (2001, 2002, and 2005). The short-finned pilot whale (*Globicephala macrorhynchus*) was once common off Santa Catalina and Santa Barbara islands and was reported infrequently in the Santa Barbara Channel. Since the 1982–1983 El Niño event, however, this species has virtually disappeared and only recently has been reported, although not in its previous abundance. It is unlikely this species would occur within the Project site.

The Risso's dolphin (*Grampus griseus*) is commonly seen, particularly along the escarpment north of the four northern Channel Islands. It is possible that the Risso's dolphin would be encountered offshore. Two species of common dolphin, the long-beaked (*Delphinus capensis*) and the short-beaked (*Delphinus delphis*), are abundant in the region and would very likely be encountered offshore near the Project site. Although both species favor escarpments and prey on squid, they mainly prey on small schooling fish such as northern anchovies, which are common off the mainland coast. Two stocks of bottlenose dolphins (*Tursiops truncatus*) exist in the Southern California Bight. The coastal stock comprises only approximately 206 individuals, while the offshore stock includes approximately 5,065 individuals (Carretta et al. 2005). The offshore stock is often seen in the San Pedro Channel and off Santa Catalina and Santa Barbara Islands and, to a much lesser extent, in the Santa Barbara Channel. The presence of this stock near the proposed FSRU site is unlikely. The coastal stock ranges from northern Baja California to Central California but is often concentrated from Ventura through San Luis Obispo Counties. This stock occurs from the surf zone to approximately 0.6 NM (0.7 mile or 1.1 km) offshore. It may be sporadically present along the nearshore sections of the pipeline route.

Porpoises include Dall's porpoise (*Phocoenoides dalli*) and the harbor porpoise (*Phocoena phocoena*). Dall's porpoise is a cold-water species that most often appears in spring and early summer, and its presence in the offshore waters near the Project site is possible. The harbor porpoise, a coastal species, is uncommon south of Point Conception. The odds of its occurrence within the Project site are remote.

Other *odontocetes* occurring in the region include two species of sperm whales: the dwarf sperm whale (*Kogia simus*) and the pygmy sperm whale (*Kogia breviceps*). These are both cryptic species that remain submerged for extended periods. Although they favor basins and trenches, neither species has been reported near the Project site, except for rare stranded specimens, or over the Hueneme Canyon.

Seven species of beaked whales have been reported in the region. Baird's beaked whale (*Berardius bairdii*) is associated with continental slope and deep ocean waters and has not been reported near the Project site. Its presence is extremely unlikely. The other six beaked whales (noted in Table 4.7-3 above), similar to the sperm whales mentioned above, are cryptic in behavior and remain submerged for extended periods.

*Pinnipeds and Mustelids*

Seven species of pinnipeds and one mustelid have been reported in the Southern California Bight (see Table 4.7-4). Of these, two pinniped species (Guadalupe fur seal and Steller sea lion) and the mustelid (southern sea otter) are federally listed as threatened. Species descriptions for non-threatened and non-endangered species are given below. Species descriptions for the two federally listed pinnipeds and one federally listed mustelid are discussed in "Special Status Species" below.

**Table 4.7-4 Occurrence of Pinnipeds and Mustelids in or near the Project Site**

| Species | Protected Status Other than Under MMPA | Stock Size | Occurrence in the Southern California Bight | Reported near Project Site | Potential Occurrence in Proposed Project Site |
|---|---|---|---|---|---|
| **Pinnipeds** | | | | | |
| Steller sea lion | Federal threatened | 44,996 | Extremely rare | No | Extremely remote |
| Guadalupe fur seal | Federal and State threatened | 7,408 | Rare | No | Extremely remote |
| California sea lion | None | 237,000-244,000 | Common | Yes | Likely |
| Northern fur seal | None | 7,784 | Uncommon | No | Extremely remote |
| Northern elephant seal | None | 101,000 | Common | No | Unlikely at FSRU site |
| Pacific harbor seal | None | 34,233 | Common | Yes | Likely |
| Ribbon seal | None | Not applicable to area | Extremely rare | No | Extremely remote |
| **Mustelids** | | | | | |
| Southern sea otter | Federal threatened | 2,735 | Rare | No | Remote |

*Sources*: Carretta et al. 2005; Angliss and Outlaw 2005; USGS 2005 ; Carretta et al. 2000; Woodhouse 1995.

The California sea lion (*Zalophus californianus c.*) is the most common pinniped in the Southern California Bight, both in numbers and in distribution, and several rookeries exist on the Channel Islands. California sea lions are present year-round in the Southern California Bight, although females may range into Central California and males as far north as British Columbia from fall through spring. California sea lions are common throughout the waters of the bight and are known to be present near the Project site.

Northern fur seals (*Callorhinus ursinus*) have two rookeries on San Miguel Island. They are pelagic animals, occurring as far north as the Bering Sea. The chances of these seals occurring at the Project site are extremely remote.

The northern elephant seal (*Mirounga angustirostris*) has become abundant over the past few decades. It ranges from Baja California to the Gulf of Alaska, with rookeries on several islands off Baja California, the Channel Islands, along the Central California coast, and at the Farallon Islands off San Francisco. They generally forage in deep waters throughout their range, although most of those in the Channel Islands appear to travel north, with males going as far as the Gulf of Alaska. They have been known to be attracted to the vicinity of power plants at which there is a warm-water discharge; however, it is considered unlikely that elephant seals would be able to detect discharge from the FSRU, as it would be fairly isolated from warmer waters at the coast or other warm water discharges. Therefore, the chance of this species occurring near the Project site is unlikely.

The Pacific harbor seal (*Phoca vitulina richardsi*) is common year-round throughout the Southern California Bight. Rookeries exist throughout the Channel Islands and along the mainland coast. Harbor seals generally do not travel far from their rookery and haul-out sites; journeys of a few hundred miles are unusual. The nearest harbor seal rookeries to the Project site are on Anacapa Island and at Mugu Lagoon, at the Naval Air Warfare Center Point Mugu. Mugu Lagoon is less than 5 NM (5.8 miles or 9.3 km) southeast of the pipeline shore crossing.

In addition, the ribbon seal (*Histriophoca fasciata*), an Alaskan species, was reported once in the Southern California Bight (Woodhouse 1995). The chance of this species occurring near the Project site is extremely unlikely.

*Special Status Species*

The species listed in Table 4.7-5 are endangered or threatened under either the Federal or State ESA. The Guadalupe fur seal is the only marine mammal listed under the California ESA (listed in 1971). No additional candidates for listing are proposed at this time. No critical habitat has been declared in the Southern California Bight for any of the listed species.

The species discussed below are considered strategic under the MMPA. A strategic stock is any marine mammal stock: (1) for which the level of direct human-caused mortality exceeds the potential biological removal level, (2) which is declining and likely to be listed as threatened under the ESA, or (3) which is listed as threatened or endangered under the ESA or as depleted under the MMPA. The same stocks are also considered depleted (populations fall below optimum sustainable levels) under the MMPA.

**Table 4.7-5 Occurrence of Federally Listed Threatened or Endangered Cetacean, Pinniped, and Mustelid Species Potentially Occurring in or near the Project Site**

| Species | Protected Status Other than Under MMPA | Stock Size | Occurrence in Southern California Bight | Potential Occurrence in Project Area | Section 7 Assessment[a] |
|---|---|---|---|---|---|
| **Cetaceans** | | | | | |
| Sei whale | Federal endangered | Not available | Extremely rare; not reported near Project site | Extremely remote | May affect, but not likely to adversely affect |
| Blue whale | Federal endangered | 1,744 | Seasonally abundant along escarpments; not reported near Project site | Unlikely at FSRU, but may occur near LNG carrier approach routes | Likely to adversely affect; see Impact BioMar-5, Section 4.7.4 |
| Fin whale | Federal endangered | 3,279 | Uncommon; reported near Project site | Unlikely at FSRU, but may occur near LNG carrier approach routes | Likely to adversely affect; see Impact BioMar-5, Section 4.7.4 |
| Humpback whale | Federal endangered | 856 | Seasonally abundant along escarpments; reported near Project site | Unlikely at FSRU, but may occur near LNG carrier approach routes | Likely to adversely affect; see Impact BioMar-5, Section 4.7.4 |
| North Pacific right whale | Federal endangered | Not available | Extremely rare; not reported near Project site | Extremely remote | May affect, but not likely to adversely affect |
| Sperm whale | Federal endangered | 1,233 | Rare; not reported near Project Site | Extremely remote | May affect, but not likely to adversely affect |
| **Pinnipeds** | | | | | |
| Steller sea lion | Federal threatened | 44,996 | Extremely rare; not reported near Project site | Extremely remote | May affect, but not likely to adversely affect |
| Guadalupe fur seal | Federal and State threatened | 7,408 | Rare; not reported near Project site | Extremely remote | May affect, but not likely to adversely affect |
| **Mustelids** | | | | | |
| Southern sea otter | Federal threatened | 2,735 | Rare; not reported near Project site | Remote | May affect, but not likely to adversely affect |

*Sources*: Carretta et al. 2001, 2002, 2005; Angliss and Outlaw 2005.

[a]These Federal Endangered Species Act (ESA) assessments reflect the current status of consultations with National Oceanic and Atmospheric Association's National Marine Fisheries Service (NMFS); see the January 31, 2007, ESA and Marine Mammal Protection Act consultation letter from Rodney McInnis of NMFS to Mark Prescott of the USCG in Appendix I.

Sei Whale (*Balaenoptera borealis*) – Federal Endangered

Sei whales in the eastern North Pacific, east of 180 degrees west longitude, are considered a separate stock for management purposes. The stock size and the population trends are not known. Sei whale observations have been rare in the Southern California Bight for more than 20 years. The chance of any sei whales appearing near the Project site is extremely remote. Therefore, the Project may affect, but is not likely to adversely affect, sei whales.

Blue Whale (*B. musculus*) – Federal Endangered

The eastern North Pacific stock of blue whales is robust at present. Sightings have become much more frequent recently, but it is not known whether this represents a change in distribution or a definite increase in stock size. The most recent stock estimate is 1,744 (Carretta et al. 2005). Blue whales usually appear off California in June and remain through October. Although occasional individuals have been reported year round, most blue whales winter off Mexico and Central America (Larkman and Veit 1998).

Off California, blue whales favor escarpments, where upwelling and consequent food production are vigorous. They frequent the Santa Rosa-Cortes Ridge, northwest of San Nicolas Island, and often follow the escarpment leading northwest to San Miguel Island. They generally continue along this escarpment, which circles the west end of San Miguel Island and doubles back along the north shores of the four northern Channel Islands. Blue whales also cross the west end of the Santa Barbara Channel, following various coastal escarpments all the way to the gulf of the Farallon Islands and beyond. Very few blue whales have been reported near the mainland coast of the Southern California Bight, and its presence is unlikely near the FSRU site but may occur near LNG carrier approach routes. If this species occurs near the FSRU site, it would be adversely affected by noise impacts, as described in Section 4.7.4 under Impact BioMar-5. The Project would be likely to adversely affect blue whales due to the adverse impacts described in Section 4.7.4 under Impact BioMar-5.

Fin Whale (*B. physalus*) – Federal Endangered

The California-Oregon-Washington stock of fin whales may have increased slightly over the past two decades. The present estimated stock size is 3,279 (Carretta et al. 2005). Fin whales frequent the continental slope and coastal basins. They have been seen occasionally with blue and humpback whales along the escarpment north of the four northern Channel Islands (see previous and following species accounts).

Fin whales are most frequently seen during the warmer-water months of summer and fall. They have been frequently sighted west and northwest of San Nicolas Island in fall. Fin whales also have been reported occasionally around Santa Barbara Island and northwest of the island in late summer and early fall. Although one fin whale was observed in late winter near the middle of the proposed pipeline route during the 1991–1992 National Oceanic and Atmospheric Administration National Marine Fisheries

Service (NMFS) aerial surveys, the vast majority of sightings have been well to the southwest of this location. Although the presence of this species near the FSRU is possible, it is unlikely. If this species occurs near the FSRU site, it would be adversely affected by noise impacts, as described in Section 4.7.4 under Impact BioMar-5. This species may also occur near LNG carrier approach routes. The chances of fin whales appearing near the mainland coast are considered extremely remote. The Project would be likely to adversely affect blue whales due to the adverse impacts described in Section 4.7.4 under Impact BioMar-5.

<u>Humpback Whale (*Megaptera novaeangliae*) – Federal Endangered</u>

The eastern North Pacific stock of humpback whales has been estimated at 1,391 and may be increasing (Carretta et al. 2005). This stock ranges from Central America and Mexico, where it winters, to Washington State. Humpbacks, like blues, frequent escarpments where upwelling is vigorous. They have been reported southwest of San Clemente Island during summer and fall and off San Nicolas Island. Like blue whales, they appear to follow the Santa Rosa-Cortes Ridge to the south side of San Miguel Island, entering the Santa Barbara Channel as they round the island.

Humpbacks generally appear in the channel in mid- to late May, a few weeks earlier than blue whales. From the Santa Barbara Channel, they also range north to the gulf of the Farallons and beyond. Unlike blue whales, however, humpbacks range closer to the mainland coast and have been reported around many oil platforms in the Santa Barbara Channel. Humpbacks have not been reported near the mainland coast south of Point Dume, and the chance of this species appearing at or near the FSRU is very unlikely. If this species occurs near the FSRU site, it would be adversely affected by noise impacts, as described in Section 4.7.4 under Impact BioMar-5. This species may also occur near LNG carrier approach routes. The Project would be likely to adversely affect blue whales due to the adverse impacts described in Section 4.7.4 under Impact BioMar-5.

<u>North Pacific Right Whale (*Eubalaena japonica*) – Federal Endangered</u>

The North Pacific right whale was recently reclassified as a separate species based on genetic data (Rosenbaum et al. 2000). The North Pacific right whale is the most gravely endangered of all marine mammals in the region, if not in the world. No estimates of its stock size are available, but only 100 to 200 animals are thought to survive (Wada 1973; Braham and Rice 1984). Just one calf has been reported in the eastern North Pacific since 1900. Only 23 individuals were sighted during the period 1855 to 1982 (Scarff 1986). Since that time, two sightings have been reported in the Santa Barbara Channel. The most recent southernmost sighting was made in 1998 off Cabo San Lucas, Baja California Sur, Mexico (Gendron et al. 1999).

Historically, the range of this species extended from latitude 35°N, or near Avila Beach and Morro Bay, California, to the Arctic, with occasional animals reported as far south as central Mexico, or about latitude 20°N. Considering the extreme rarity of this species, the likelihood of it appearing at or near the Project site is extremely remote.

Therefore, the Project may affect, but is not likely to adversely affect, north Pacific right whales.

Sperm Whale (*Physeter macrocephalus*) – Federal Endangered

The sperm whale is the only listed odontocete. The California-Oregon-Washington stock size is estimated at 1,233 (Carretta et al. 2005). Population trends are unknown. Sperm whales have been reported year-round off California, with peak numbers appearing from April through mid-June and from the end of August into mid-November (Rice 1974). Off California, sperm whales frequent deep offshore waters, although in the Gulf of California they sometimes venture into shallow water after the various species of squid that form a staple of their diet. Single sperm whales have been reported on three occasions in the Santa Barbara Channel. Considering this species' preference for deep offshore water, the chances of it appearing at or near the Project site are extremely remote. Therefore, the Project may affect, but is not likely to adversely affect, sperm whales.

Steller Sea Lion (*Eumetopias jubatus*) – Federal Threatened

The eastern stock of Steller sea lions ranges from east of Cape Suckling, Alaska, or about 144 degrees west longitude, to the Southern California Bight. The eastern stock is currently estimated at 44,996. The California stock of "non-pups" declined to 1,500 between 1980 and 1998 from a stock of 5,000 to 7,000 during the period 1927 to 1947 (Angliss and Outlaw 2005). Historically, Steller sea lions occurred at San Nicolas Island. Steller sea lions once inhabited San Miguel Island but disappeared after the 1982–1983 El Niño event. Only two sightings, both of individual animals, have been made in the bight since that time (Melin 2004; Howorth 2006). The odds of this species appearing at or near the Project site are considered extremely remote. Therefore, the Project may affect, but is not likely to adversely affect, Steller sea lions.

Guadalupe Fur Seal (*Arctocephalus townsendi*) – Federal Threatened

The Guadalupe fur seal population is concentrated at Guadalupe Island, off central Baja California on the Pacific side. A few pups have been reported at Isla de Benito del Esta, also off Baja California, while a few adults have been reported in the Gulf of California (Gamboa 1999). The last estimate of the Mexican stock size was 7,408, made in 1993 (Maravilla-Chavez and Lowry 1997). No stock size estimate is available for U.S. waters.

Guadalupe fur seals were once prolific at the Channel Islands. A few individuals have been reported there over the past century, and during the winter of 1997–1998 a pup was successfully weaned at San Miguel Island (Melin and DeLong 1999). Strandings of this species are rare, with perhaps a dozen specimens reported in the Southern California Bight over the past three decades. Considering the rarity of this species in U.S. waters, the chances of it appearing near the Project site are extremely remote. Therefore, the Project may affect, but is not likely to adversely affect, Guadalupe fur seals.

<u>Southern Sea Otter (*Enhydra lutris nereis*) – Federal Threatened</u>

The California population of the southern sea otter has been generally increasing since a remnant colony was discovered off Bixby Creek, off Central California, in 1937. Fluctuations in the stock over the past decade have been a cause for concern, although the 2003 count (2,825) was the highest made over the past 20 years, since modern census methods were initiated (USGS 2004). In 2005, the count was 2,735 (USGS 2005).

The present range of sea otters extends from Point Conception to Año Nuevo Island, in Santa Cruz County, California. During the spring over the past few years, some sea otters, primarily young males, have ventured south of Point Conception into the rich kelp beds between Gaviota and the point. Sightings farther south along the mainland coast have been rare. The southernmost sighting of a sea otter was made at Isla Magdalena, Baja California (Rodriguez-Jaramillo and Gendron 1996). Occasional sightings have been made at the Channel Islands, particularly San Miguel.

From 1987 to 1990, 139 sea otters were relocated from offshore Central California to San Nicolas Island in an unsuccessful attempt to establish a new population. Although some otters remain there, it is not known whether some are relocated animals, their offspring, other animals that have moved in, or a combination. The U.S. Fish and Wildlife Service (USFWS) recently proposed discontinuing the program and the "no-otter zone" established to support the program. Sea otters generally forage in water depths up to 65 feet (20 m), although some have been reported in water up to 130 feet (40 m) deep. Additionally, kelp beds, a preferred foraging habitat for sea otters, are not present at or near the Project site. Considering the narrow depth range of this species and its scarcity south of Point Conception, the chances of any being seen even in the nearshore waters near the Project site are remote. Therefore, the Project may affect, but is not likely to adversely affect, southern sea otters.

### 4.7.1.6 Seabirds

**Habitats**

Like marine mammals and sea turtles (see Section 4.7.1.5, "Marine Mammals," and Section 4.7.1.7, "Sea Turtles"), seabirds are wide-ranging and occupy a variety of habitats. The majority of species migrate seasonally through the region, while others are resident year-round. Many species use nearshore and/or offshore waters as foraging grounds for fish and invertebrate prey. Some also use the nearby Channel Islands as roosting sites and sometimes as rookeries. A number of species, including shorebirds and various marsh birds, forage and nest in mainland estuaries or along the shores; these are discussed in Section 4.8, "Biological Resources – Terrestrial."

Along California's coast, the continental shelf near the Southern California Bight is a biologically productive and globally important region, and abundant prey supports an equally abundant seabird population (Mills et al. 2005). However, the distribution and local or regional abundance of all species of seabirds in Southern California can fluctuate widely from year to year and decade to decade (Ainley et al. 1995, Mills et al. 2005). While these fluctuations may be attributable largely to prey abundance and distribution in response to changes in sea surface temperatures, all seabird species do not respond uniformly and often show patterns inconsistent with one another (Ainley et al. 1995). Studies of 5 to 10 years in duration would be the minimum required to characterize variability in the avifauna of the region (Ainley et al. 1995). While sea surface temperature increases in the Peru Current have led to mass seabird mortality, similar increases in the California Current have not, probably owing to a more diverse prey base, including anchovy, Pacific mackerel, rockfish, squid, and krill (Ainley et al. 1995).

One study of the distribution and abundance of seabirds in the Southern California Bight identified 485,610 birds of 54 species, in 12 families (Mason et al. 2004). Seabird densities at sea were greatest near the northern Channel Islands in January and north of Point Conception in May. In comparison with data from 20 years previous (1975–1983), seabird numbers were down 14 percent, 57 percent, and 42 percent for January, May, and September, respectively. Several species' populations declined, including common murres (declined 75 to 87 percent), sooty shearwaters (declined 55 percent), and Bonaparte's gull (declined 95 to 100 percent). However, some species increased since that time, including brown pelicans (increased 167 percent), Xantus's murrelet (increased 125 percent), Cassin's auklet (increased 100 percent), and western gulls (increased 55 percent) (Mason et al. 2004). This and other studies show that seabird densities are higher along island and mainland coastlines as compared with the open ocean (Mason et al. 2004, Mills et al. 2005). Storm petrels (*Oceanodroma* spp., including Leach's, ashy, and black), cormorants (*Phalacrocorax* spp., including double-crested, Brandt's, and pelagic), gulls, murres, puffins, pelicans, and auklets nest and/or roost on, and otherwise make use of the Channel Islands. On Anacapa Island alone, special status seabirds including the brown pelican and Xantus's murrelet, in addition to more common species, are known to nest (Mills et al. 2005).

**Taxa**

In the adjacent Channel Islands, Santa Barbara Channel, and off the mainland coast, some 195 species of seabirds have been recorded (Baird 1993). Considering their speed and mobility, it is likely that virtually all of these species may occur at or near the Project site.

*Common Species*

Because of the abundance and diversity of seabirds in the Southern California Bight, common marine birds are summarized by families and subfamilies instead of species. Emphasis has been placed on seabirds that land on or dive into the ocean because such species are more vulnerable to potential offshore Project-related impacts such as LNG, oil, or fuel spills. Families and subfamilies represented by common local species are listed below:

- Family Gaviidae: loons
- Family Podocipedidae: grebes
- Family Procellariidae: shearwaters, petrels, and the northern fulmar (*Fulmaris glacialis*)
- Family Phalacrocoridae: cormorants
- Subfamily Aythyinae: diving ducks and the surf scoter (*Melanitta perspicillata*)
- Family Laridae: gulls and terns
- Family Hydrobatidae: storm petrels
- Family Phalaropidae: phalaropes
- Family Alcidae: auklets, puffins, murres, murrelets, and the pigeon guillemot (*Cepphus columba*)
- Family Stercorariidae: jaegers and skuas

*Special Status Species*

Most seabirds are protected under the Federal Migratory Bird Treaty Act. In addition, some are listed as State species of special concern:

- Double-crested cormorant (*Phalocrocorax auritus*)
- Elegant tern (*Sterna elegans*)
- Long-billed curlew (*Numenius americanus*)
- California gull (*Larus californicus*)
- Common loon (*Gavia immer*)
- Ashy storm petrel (*Oceanodroma melania*)
- Rhinoceros auklet (Cerohinca monocerata)

Several species of shorebirds and seabirds that may occur in the vicinity of the proposed Project area are listed as threatened or endangered (see Table 4.7-5a). The California least tern (*Sterna albifrons browni*), the western snowy plover (*Charadrius alexandrinus nivosus*), and the California brown pelican (*Pelecanus occidentalis californicus*)—all Federally threatened or endangered species—are discussed in greater detail in Section 4.8, “Biological Resources – Terrestrial.” Federally threatened and endangered seabirds found offshore are discussed below.

**Table 4.7-5a Occurrence of Threatened or Endangered Seabird Species Potentially Occurring in or near the Project site**

| Species | Protected Status | Species Density | Occurrence in Southern California Bight | Potential Occurrence in Project Area | Section 7 Assessment[b] |
|---|---|---|---|---|---|
| California brown pelican[a] | State and Federal Endangered | 0.3 pelican per $km^2$ | Common | Likely | May affect, but not likely to adversely affect |
| Marbled murrelet | State Threatened and Federal Endangered | Not available | Uncommon | Unlikely during winter and extremely unlikely during breeding season | Not applicable; species not identified during Section 7 consultation |
| Xantus's murrelet | State Threatened and Federal Candidate | Up to 0.1 murrelet per $km^2$ | Uncommon | Unlikely during breeding season | Not applicable; species not identified during Section 7 consultation |

*Sources* : Mills et al. 2005; McShane et al. 2004.

*Notes:*

[a] Brown pelican is also discussed in Section 4.8.

[b] These Federal Environmental Species Act assessments reflect the current status of consultations with NOAA's National Marine Fisheries Service; see Appendix I.

<u>California Brown Pelican (Pelecanus occidentalis californicus) – State and Federal Endangered</u>

The California brown pelican ranges from northwestern Mexico to British Columbia. The main breeding colonies are in the Gulf of California and on the Tres Marias Islands off mainland Mexico. Colonies have ranged as far north as Point Lobos, in Monterey, California. In the Southern California Bight, California brown pelicans nest only on Anacapa and Santa Barbara islands (Mills et al. 2005), although they once nested on other islands. At the Channel Islands, breeding generally takes place from March through early August (Minerals Management Service 2001). Fledging takes place in about 13 weeks (USFWS 1983; Cogswell 1977). As early as May, large numbers of pelicans arrive from Mexico. By July, most are north of Point Conception. Some will travel as far north as British Columbia by late summer or early fall. From December through March, all but about 500 pairs leave the northern area, many returning to Mexico (Minerals Management Service 2001). Critical habitat has not been established for this species. California brown pelicans are common in the bight year-round and will be seen throughout the region and within and near the Project site. The mean at-sea density (birds per $km^2$) of brown pelicans throughout the California Current was estimated to be 0.3 pelicans per $km^2$ in July and 0.3 pelicans per $km^2$ in December (Mills et al. 2005). During consultations with the Channel Island National Marine Sanctuary (CINMS) Sanctuary Manager (Mobley 2004), installation of the FSRU and the pipelines were found not to be inconsistent with the Sanctuary. Therefore, the Project may affect, but is not likely to adversely affect, California brown pelicans.

Marbled Murrelet (Brachyramphus marmoratus marmoratus) – State Threatened; Federal Threatened

In North America, the year-round range of the marbled murrelet extends from the Aleutian Archipelago in Alaska, south on the coast throughout Alaska, British Columbia, Washington, and Oregon, to Central California. Marbled murrelets spend the majority of their lives on the ocean, and when at sea are usually found close to land, generally staying within 0.6 to 1.2 NM (0.7 to 1.4 miles, or 1.1 to 2.2 km) of shore. However, marbled murrelet nesting biology is unique; unlike other seabirds in the same (auk) family, they nest singly in large stands of old growth coniferous forests, often far inland (up to 30 miles [48 km]) from the ocean. Stand size is an important factor for marbled murrelets; they commonly occupy large stands of timber, typically hundreds of acres, and are commonly absent from smaller stands.

Because of their habits, it is difficult to estimate the population size. But these birds reproduce very slowly, as they lay only a single egg, and annual survival is low. Marbled murrelets are declining due to loss of nesting habitat from commercial timber harvesting. Additionally, they are highly susceptible to mortality from gill-net fishing and oil spills, owing to their nearshore habits; these mortality sources also cause population declines. Generally, the California population is experiencing a pattern of annual decline, and if declines are not reversed, it is expected that the species may be extirpated from California entirely (McShane et al. 2004).

In 1992, the Washington, Oregon, and California population of the species was listed as Federal threatened. Critical habitat has been designated for the marbled murrelet, and a USFWS recovery plan is in effect. Although some wintering birds are sometimes found in Southern California, the breeding range in California is roughly north of the northern half of Monterey County. The southernmost Marbled Murrelet Conservation Zone (Zone 6) corresponds with this endpoint in Monterey County and extends northward to Marin County (McShane et al. 2004). Accordingly, the proposed Project site does not lie within a Marbled Murrelet Conservation Zone. During winter, small numbers of marbled murrelets could possibly occupy the nearshore waters adjacent to and within the Project site. However, because the species' breeding range does not extend to the proposed FSRU site, the species is expected to occur there only in very low numbers, if at all. This species was not identified by Federal agencies as potentially affected by the proposed Project during Section 7 consultations.

Xantus's Murrelet (Synthliboramphus hypoleucus) – State Threatened; Federal Candidate

Xantus's murrelets range from Baja California to at least Oregon (Thoresen 1992). They nest colonially, in only about a dozen locations, currently or historically including Anacapa, San Miguel, and Santa Cruz Islands, and they may nest on Santa Catalina and San Clemente Islands (Mills et al. 2005) and on several islands off the northwestern coast of Baja California. At Santa Barbara Island, eggs are laid from mid-February through mid-June (Pacific Seabird Group 2002). They nest on the ground on steep slopes or cliff faces, under vegetation, on ledges or hollows, and in crevices. They nest from near the waterline to several hundred feet above. A maximum of two chicks hatch, and chicks depart the nest within about two days. These birds may winter in the Southern California Bight, but probably disperse widely from nesting locations (Pacific Seabird Group 2002). A habitat restoration project has resulted in reestablishing nesting by Xantus's murrelets on Anacapa Island by removing non-native black rats (Boyce et al. 2004). From April through June, radio telemetry-instrumented Xantus's murrelets ranged an average of 17.8 NM (20.5 miles or 33 km) from Anacapa Island and an average of 28.6 NM (32.9 miles or 53 km) from Santa Barbara Island (Hamilton et al. 2004). The average at-sea density for Xantus's murrelet throughout the California Current System is low; no birds were detected in July, and 0.1 murrelet per $km^2$ was recorded in December (Mills et al. 2005). This species would be encountered near the Project site, but at-sea densities are low. This species was not identified by federal agencies as potentially affected by the proposed Project during Section 7 consultations.

### 4.7.1.7 Sea Turtles

#### Habitats

The cheloniids, which include the green sea turtle (*Chelonia mydas*), the loggerhead sea turtle (*Caretta caretta*), and the olive ridley sea turtle (*Lepidochelys olivacea*), frequent tropical to temperate waters and generally appear as transients in the Southern California Bight, usually during the warm-water months of summer and early fall or during El Niño events. A few cheloniids have been reported stranded as far north as Alaska during El Niño events. Nonetheless, the bight lies beyond the normal habitat for these species. A notable exception is an anomalous population of 50 to 60 green sea turtles in San Diego Bay (Dutton and McDonald 1990a, 1990b, 1992), which frequent the warm water discharge of the San Diego Gas and Electric Company power plant. The leatherback sea turtle (*Dermochelys coriacea*) ranges from Chile to Alaska; thus, the Southern California Bight is considered within its normal range and foraging habitat.

#### Taxa

Four species of sea turtles have been reported in the northeastern Pacific. Three are members of the family *Cheloniidae*, while the fourth is the only living representative of the family *Dermochelyidae* (NMFS and USFWS 1998d). They are all federally listed, and species descriptions are provided in Table 4.7-6.

*Special Status Species*

All species reported in the Southern California Bight and listed in Table 4.7-6 are considered endangered or threatened under both the Federal and State ESAs. (No unlisted species or candidate species of sea turtles are present.) No critical habitat has been established for these species in California. No stock sizes are available and all stocks continue to decline (NOAA Fisheries and USFWS 1998a–d). Sea turtles have not been reported at or near the Project site despite a comprehensive study by Stinson (1984) and numerous marine mammal surveys conducted between 1975 and 1993

(Bonnell et al. 1981; Dohl et al. 1981; Hill and Barlow 1992; Carretta and Forney 1993; Mangels and Gerrodette 1994; Carretta et al. 2000 and 2001; Barlow and Taylor 2001*)*.

**Table 4.7-6 Occurrence of Federally Listed Threatened and Endangered Species of Sea Turtles in or near the Project Site**

| Species | Federal Protected Status | Stock size | Occurrence in Southern California Bight | Potential Occurrence in Project Area | Section 7 Assessment[a] |
|---|---|---|---|---|---|
| Green sea turtle | Threatened | Not available | Rare; not reported near Project site | Very unlikely | Likely to adversely affect; see Impact BioMar-5, Section 4.7.4 |
| Loggerhead sea turtle | Threatened | Not available | Rare; not reported near Project site | Very unlikely | Likely to adversely affect; see Impact BioMar-5, Section 4.7.4 |
| Olive Ridley sea turtle | Threatened | Not available | Rare; not reported near Project site | Very unlikely | Likely to adversely affect; see Impact BioMar-5, Section 4.7.4 |
| Leatherback sea turtle | Endangered | Not available | Uncommon but offshore; not reported near Project site | Very unlikely | Likely to adversely affect; see Impact BioMar-5, Section 4.7.4 |

*Sources:* NMFS and USFWS 1998a–d; NOAA 2000b.

[a]These Federal Endangered Species Act assessments reflect the current status of consultations with NOAA's National Marine Fisheries Service (NMFS); see the Jan 31, 2007, ESA and Marine Mamma Protection Act consultation letter from Rodney McInnis of NMFS to Mark Prescott of the USCG in Appendix I.

<u>Green Sea Turtle (Chelonia mydas) – Federal Threatened</u>

Although the eastern North Pacific green sea turtle population is considered threatened, the Mexican nesting population is listed as endangered. The normal range of the green sea turtle is from Baja California to Peru and out to the Galapagos Islands. This species occasionally appears in the Southern California Bight during the warmest-water months of July through October. North of Point Conception, this species occurs mainly during El Niño events. Juveniles have been reported offshore in the Southern California Bight (NOAA Fisheries and USFWS 1998a), while adults have been observed along the coast in water up to 165 feet (50.3 m) deep (Stinson 1984). None have been reported at or near the Project site, nor is it considered likely that they would be able to detect the warm water discharge from the FSRU and be attracted to it. Thus the odds of this species occurring in the Project area are very small. However, if green sea turtles are in the area affected by construction or in the vicinity of the FSRU during operation, they may be adversely affected by noise, as discussed in Section 4.7.4 under Impact BioMar-5. Therefore, the Project would be likely to adversely affect green sea turtles.

<u>Loggerhead Sea Turtle (*Caretta caretta*) – Federal Threatened</u>

Loggerheads favor tropical to temperate waters. Loggerheads are often reported off Baja California, particularly at Bahia Magdalena. They are rare off California, although individuals have been reported as far north as Alaska. They most often are seen from July through September, particularly during El Niño events. Juvenile loggerheads have been reported occasionally in deep water off the Southern California Bight. This may represent the northern extremity of the range of a much larger population of juveniles found off Baja California (Pitman 1990). The chance of any loggerheads appearing in the Project site is extremely remote. However, if loggerheads in the area are affected by construction or in the vicinity of the FSRU during operation, they may be adversely affected by noise, as discussed in Section 4.7.4 under Impact BioMar-5. Therefore, the Project would be likely to adversely affect loggerhead sea turtles.

<u>Olive Ridley Sea Turtle (*Lepidochelys olivacea*) – Federal Threatened</u>

Like the green sea turtle, the Mexican nesting population of the olive ridley sea turtle is considered endangered. The olive ridley sea turtle ranges from tropical to temperate waters, usually from Baja California to Peru in waters up to 1,200 NM (1,382 miles or 2,224 km) offshore (NOAA Fisheries and USFWS 1998b). Juveniles have been reported offshore, while adults and sub-adults were most often reported very near the coast, in water up to 165 feet (50.3 m) deep. Stinson (1984) considered this species rare in the Southern California Bight, and no olive ridleys were seen during extensive marine mammal surveys conducted between 1975 and 1993 (Bonnell et al. 1981; Dohl et al. 1981; Hill and Barlow 1992; Carretta and Forney 1993; Mangels and Gerrodette 1994; Carretta et al. 2000 and 2001; Barlow and Taylor 2001). The odds of any olive ridley sea turtles appearing at or near the Project site are extremely remote. However, if olive ridley sea turtles are in the area affected by construction or in the vicinity of the FSRU during operation, they may be adversely affected by noise, as discussed in Section 4.7.4, Impact BioMar-5. Therefore, the Project would be likely to adversely affect olive ridley sea turtles.

<u>Leatherback Sea Turtle (*Dermochelys coriacea*) – Federal Endangered</u>

In the eastern Pacific, leatherback sea turtles range along the continental slope from Chile to Alaska in waters 550 to 4,200 feet (168 to 1,280 m) deep. Leatherbacks are the most frequently seen off California, usually appearing from July through September. The frequency of sightings may at least be partly attributable to the sheer size of this species; leatherbacks attain overall lengths of up to 7 feet (2.1 m), making them more conspicuous than the smaller chelonids. Nonetheless, leatherbacks were sighted on only four occasions during the extensive marine mammal survey conducted between 1975 and 1993 (Bonnell et al. 1981; Dohl et al. 1981; Hill and Barlow 1992; Carretta and Forney 1993; Mangels and Gerrodette 1994; Carretta et al. 2000 and 2001; Barlow and Taylor 2001). Considering the scarcity of sightings and this species' preference for the continental slope, the chance of any leatherback sea turtles appearing at or near the Project site is extremely remote. However, if leatherback sea turtles are in the area affected by construction or in the vicinity of the FSRU during operation, they may be adversely affected by noise, as discussed in Section 4.7.4 under Impact BioMar-5. Therefore, the Project would be likely to adversely affect leatherback sea turtles.

### 4.7.2 Regulatory Setting

Major Federal and State laws and regulations pertaining to marine resources are summarized in Table 4.7-7. There are no known local ordinances or regulations that protect specific marine habitats or species for the Project site.

**Table 4.7-7 Major Laws, Regulatory Requirements, and Plans for Biological Resources – Marine**

| Law/Regulation/ Plan/Agency | Key Elements and Thresholds; Applicable Permits |
|---|---|
| **Federal** | |
| Outer Continental Shelf Lands Act<br>*- Minerals Management Service (MMS)* | • The statute defines the outer continental shelf (OCS) as all submerged lands lying seaward of State coastal waters (3.0 NM [3.5 miles or 5.6 km] offshore) that are under U.S. jurisdiction.<br>• The statute authorizes the Secretary of Interior to promulgate regulations to lease the OCS in an effort to prevent waste and conserve natural resources and to grant leases to the highest responsible qualified bidder as determined by competitive bidding procedures. |
| Marine Mammal Protection Act (MMPA) of 1972 and Amendments<br>*- National Oceanic and Atmospheric Administration (NOAA)* | • The 1972 MMPA established a Federal responsibility to conserve marine mammals, with management vested in the Department of Interior for sea otter, walrus, polar bear, dugong, and manatee. The Department of Commerce is responsible for cetaceans and pinnipeds other than the walrus. |
| Endangered Species Act of 1973<br>*- U.S. Fish and Wildlife Service (USFWS)* | • Provides for the conservation of endangered and threatened species of fish, wildlife, and plants. |
| Coastal Zone Management Act 307 (c)(3)(A)<br>*- California Coastal Commission* | • The policy preserves, protects, restores, or enhances the resources of the nation's coastal zone for this and succeeding generations to encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs to achieve wise use of the land and water resources of the coastal zone, giving full consideration to ecological, cultural, historic, and aesthetic values as well as the need for compatible economic development.<br>• Any Federal agency activity or Federal development project, whether it occurs inside or outside the coastal zone, that affects any land or water uses or natural resources of the California coastal zone is subject to the Federal consistency provisions of CZMA.<br>• A CZMA consistency determination is required under the DWPA. **The Applicant has initiated the consistency determination by submitting draft information in October, 2006. Discussions are currently being held between the Applicant and California coastal zone management staff regarding the level of additional information and timing of the request for consistency.** The coastal development permit review of the part of the Project in State waters satisfies Federal consistency certification requirements for those elements of the proposed Project located in State waters because the part of the Project that is within State waters is redundant with the coastal development permit. |

**Table 4.7-7 Major Laws, Regulatory Requirements, and Plans for Biological Resources – Marine**

| Law/Regulation/ Plan/Agency | Key Elements and Thresholds; Applicable Permits |
|---|---|
| Magnuson-Stevens Fishery Conservation and Management Act of 1976<br>*- NOAA* | • In the Exclusive Economic Zone (EEZ), except as provided in Section 102, the U. S. claims, and will exercise sovereign rights and exclusive fishery management authority over all fish and all continental shelf fishery resources.<br>• Beyond the EEZ, the U. S. claims and will exercise exclusive fishery management authority over all anadromous species throughout the migratory range of each such species, all continental shelf fishery resources, and all fishery resources in special areas. |
| Marine Plastic Pollution Research and Control Act<br>*- USCG* | • The Act to Prevent Pollution from Ships was amended by the Marine Plastic Pollution Research and Control Act of 1987, which implemented the provisions of Annex V of the International Convention for the Prevention of Pollution from Ships (MARPOL) relating to garbage and plastics.<br>• The discharge of plastics, including synthetic ropes, fishing nets, plastic bags, biodegradable plastics, and other food and waste products into the water is prohibited. |
| National Marine Sanctuaries Act (16 United States Code (U.S.C.) § 1431–1445, as amended by Public Law 106-513); also known as Title III of the Marine Protection, Research and Sanctuary Act of 1972 | • This act identifies and designates as national marine sanctuaries areas of the marine environment that are of special national significance and manages these areas as the National Marine Sanctuary System.<br>• Authorizes comprehensive and coordinated conservation and management of these marine areas, and activities affecting them, in a manner that complements existing regulatory authorities and maintains the natural biological communities in the national marine sanctuaries, and protects and, where appropriate, restores and enhances natural habitats, populations, and ecological processes. |
| National Invasive Species Act of 1996 | • Prevents the introduction and establishment of non-indigenous invasive species throughout the waters of the U.S. that cause economic and ecological degradation to the affected near shore regions.<br>• Compliance with and effectiveness of the guidelines will be reviewed periodically by the Secretary of Transportation. |
| Oil Pollution Act of 1990<br>*- USCG* | • Seeks to prevent and better respond to oil spills.<br>• Prohibits a visible sheen or oil content greater than 15 parts per million within 12 NM (13.8 miles or 22.2 km) of shore.<br>• Requires that oily waste be retained onboard and discharged at an appropriate reception facility.<br>• Requires the development of a facility-specific Spill Prevention, Control, and Countermeasures (SPCC) Plan for the management of fuels and hazardous materials. |
| Migratory Bird Treaty Act<br>*- USFWS* | • Defined Federal prohibition, unless permitted by regulations, to "pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, at any time, or in any manner, any migratory bird, or any part, nest, or egg of any such bird." (16 U.S.C. § 703) |

**Table 4.7-7 Major Laws, Regulatory Requirements, and Plans for Biological Resources – Marine**

| Law/Regulation/ Plan/Agency | Key Elements and Thresholds; Applicable Permits |
|---|---|
| **State** | |
| California Endangered Species Act<br>*- California Department of Fish and Game (CDFG)* | • Establishes a petitioning process for the listing of threatened or endangered species. The CDFG is required to adopt regulations for this process and establish criteria for determining whether a species is endangered or threatened.<br>• Prohibits the "taking" of listed species except as otherwise provided in State law. Unlike its Federal counterpart, the Act applies the take prohibitions to species petitioned for listing (state candidates). |
| California Species Preservation Act of 1970<br>*- CDFG* | • The California Fish and Game Commission is required to establish a list of endangered species and a list of threatened species. The commission adds or removes species from either list if it finds, upon the receipt of sufficient scientific information pursuant to this article, that the action is warranted. |
| Lempert-Keene-Seastrand Oil Spill Prevention and Response Act<br>*- CDFG* | • Requires the Administrator of the Office of Spill Prevention and Response (OSPR), CDFG, to establish rescue and rehabilitation stations for seabirds, sea otters, and other marine mammals. |
| California Harbors and Navigation Code, § 1-7340<br>*- CDFG* | • Describes and defines provisions and legislative policy for California harbors, navigable waters, traffic, cargo, wrecks and salvage, marinas, construction/improvements, and harbor and port mitigation. |
| California Fish and Game Code<br>*- CDFG* | • It is the policy of the state to conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat; it is the intent of the Legislature, consistent with conserving the species, to acquire lands for habitat for these species. |
| Coastal Act § 30230 – Marine Resources<br>*- CCC* | • Requires that marine resources are maintained, enhanced, and, where feasible, restored. Special protection is given to areas and species of special biological or economic significance. Uses of the marine environment must be carried out in a manner that will maintain the biological productivity of coastal waters and that will maintain healthy populations of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes. |
| Coastal Act § 30231 – Marine Resources<br>*- CCC* | • The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained, and, where feasible, restored through, among other means, minimizing adverse effects of wastewater discharges and entrainment, controlling runoff, preventing depletion of groundwater supplies and substantial interference with surface waterflow, encouraging wastewater reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams. |
| Coastal Act § 30232 – Marine Resources<br>*- CCC* | • Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances must be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures must be provided for accidental spills that do occur. |

**Table 4.7-7 Major Laws, Regulatory Requirements, and Plans for Biological Resources – Marine**

| Law/Regulation/ Plan/Agency | Key Elements and Thresholds; Applicable Permits |
|---|---|
| Coastal Act § 30240 – Environmentally Sensitive Habitat Area<br>*- CCC* | • Protects environmentally sensitive habitat areas against significant disruption of habitat values; only uses dependent on those resources shall be allowed in those areas.<br>• Requires that development in areas adjacent to environmentally sensitive areas and parks and recreation areas shall be sited and designed to prevent impacts that would significantly degrade those areas and shall be compatible with the continuance of those habitats and recreation areas. |
| Water Quality Control Plan: Los Angeles Region Basin Plan<br>*- Los Angeles Regional Water Quality Control Board* | • Incorporates by reference all applicable State and Regional Board plans and policies and other pertinent water quality policies and regulations. The Plan designates beneficial uses for surface water and groundwater.<br>• Basin Plan objectives would be incorporated into the National Pollutant Discharge Elimination System (NPDES) permit conditions and into the Section 401 Water Quality Certification review. |
| Water Quality Control Plan for Ocean Waters of California<br>*- State Water Resources Control Board (SWRCB)* | • The SWRCB prepared and adopted the California Ocean Plan, which protects beneficial uses of ocean waters within the State jurisdiction, and controls discharges. It incorporates the State water quality standards that apply to all National Pollutant Discharge Elimination System (NPDES) permits into the Section 401 Water Quality Certification.<br>• The Ocean Plan also authorizes the California SWRCB to designate areas of special biological significance and requires wastes to be discharged at a sufficient distance from these areas to protect the water quality. These areas include parts of Santa Catalina Island, Santa Barbara and Anacapa Islands, San Nicolas Island and Begg Rock, and Latigo Point to Laguna Point (SWRCB 2001). |

**Agency Consultations**

The USFWS and NMFS are the primary agencies responsible for compliance with Federal fish and wildlife laws, including the ESA, the Magnuson-Stevens Fishery Conservation and Management Act, and MMPA. The CDFG is responsible for protecting and perpetuating State fish and wildlife resources.

The Applicant would be required to address the proposed Project action in compliance with Section 7(c) of the ESA of 1973, as amended. Section 7 of the ESA ensures that, through consultation with the USFWS and NOAA Fisheries, Federal actions do not jeopardize the continued existence of any threatened, endangered, or proposed species, or result in the destruction or adverse modification of critical habitat. Consultations are currently in progress (see Appendix I).

The Magnuson-Stevens Fishery Conservation and Management Act requires Federal agencies to consult with NMFS on all actions, or proposed actions, authorized, funded, or undertaken by the agency, that may adversely affect EFH (Magnuson-Stevens Fishery Conservation and Management Act § 305(b)(2)). EFH means those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Fishery Conservation and Management Act § 3). For the purpose of interpreting this definition of EFH, "waters" include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; "substrate" includes sediment, hard bottom, structures underlying the waters, and associated biological communities; "necessary" means the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle (50 CFR § 600.110); and "adverse effect" means any impact that reduces quality and/or quantity of EFH and may include direct impacts, e.g., contamination or physical disruption, and indirect impacts, e.g., loss of prey or reduction in species fecundity, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR § 600.810).

The MMPA prohibits the "take" of marine mammals, with certain exceptions, in waters under U.S. jurisdiction, and by U.S. citizens on the high seas. Under Section 3 of the MMPA, "take" is defined as "harass, capture, hunt, kill, or attempt to harass, capture, hunt, or kill any marine mammal." "Harassment" is defined as "any act of pursuit, torment, or annoyance that has the potential to injure marine mammal stock in the wild; or has the potential to disturb marine mammal stock in the wild by disrupting behavioral patterns, including migration, breathing, nursing, breeding, feeding, or sheltering." In cases where U.S. citizens are engaged in activities, other than fishing, that result in "unavoidable" incidental take of marine mammals, the Secretary of Commerce can issue a "small take authorization." The authorization can be issued after notice and opportunity for public comment if the Secretary of Commerce finds negligible impacts. The MMPA requires consultation with NMFS if impacts on marine mammals are unavoidable.

NOAA NMFS has reviewed the potential impacts described in Section 4.7.4. In the most recent consultation letter (see the Jan 31, 2007, ESA and MMPA consultation letter from Rodney McInnis of NOAA NMFS to Mark Prescott of the USCG in Appendix I), NMFS provides support for the following:

- The USCG's recommendation that any license granted will include a condition that all LNG carriers transit in the specific east-west transit lanes within the U.S. Exclusive Economic Zone (EEZ);
- The USCG's recommendation that NMFS participate in the development of mitigation and monitoring protocols;
- The USCG's recommendation that any license granted will include a condition banning the use of explosives during decommissioning.

The letter states, however, that NMFS is not in concurrence with the Region of Influence (ROI) utilized for the ESA and MMPA consultation and the recommended expansion of the ROI to include the shipping lanes to the end of the EEZ. The NMFS letter also states that since potential noise impacts without further mitigation could result in Levels A and B takes, NMFS recommends that the USCG and/or the Applicant apply for a Letter of Authorization (LOA) under the MMPA for construction operations, and an Incidental Harassment Authorization (IHA) or LOA under MMPA for operations. NMFS states in the letter that it cannot concur with the USCG findings without reviewing proposed mitigation and monitoring plans and protocols. In light of the NMFS comments and recommendations, any license issued would require the Applicant, in coordination with NMFS, the USCG, and MARAD, to provide a detailed mitigation and monitoring plan approved by NMFS, and to apply for any LOA, IHA, or Incidental Take Permit if required. Additional discussion and coordination between the USCG, MARAD, and NMFS on the proper scope and extent of the ROI will be initiated by the Federal lead agencies; however, this discussion should not affect the conclusions contained in this Final EIS/EIR.

## 4.7.3 Significance Criteria

### 4.7.3.1 Marine Resources

The significance criteria for this analysis were developed using both regulatory and biologically based criteria. For example, impacts on EFH are specified and clearly defined by the Magnuson-Stevens Fishery Conservation and Management Act.

When specific criteria do not exist within the regulatory setting, biologically-based criteria are developed. For example, impacts on soft bottom benthic species are analyzed using the well-documented expected recovery time for these communities after natural disturbances. For the purposes of this document, impacts on all marine resources, including plants, invertebrates, fish, sea turtles, seabirds, and marine mammals, would be considered significant if the Project would:

- Substantially adversely affect, either directly or through habitat modifications, any species identified as a listed, candidate, sensitive, or special status species in local or regional plans, policies or regulations, or by the CDFG or USFWS;
- Degrade the quality of the environment, substantially reduce the habitat of marine biota species, cause marine biota species to drop below self-sustaining levels, threaten to eliminate wildlife community, or reduce the range of a rare or endangered species;
- Alter or destroy habitat that prevents reestablishment of biological communities that inhabited the area prior to the Project;
- Destroy or disturb on a long-term basis (more than one year) biological communities or ecosystem relationships;
- Change marine biological resources for periods:
  - Longer than a month for toxicological impacts, e.g., those caused by oiling events or toxicity caused by the discharge of drilling fluids and cuttings;
  - Longer than one year for impacts caused by habitat disturbance, e.g., construction activities, or habitat reduction, e.g., damage to hard-bottom habitat during construction activities;
- Result in significant adverse, long-term biological effects on a population or habitat; or

- Expose marine life to contaminants that could cause acute or chronic toxicity or bioaccumulation.

### 4.7.3.2 Fish and Invertebrates

For the purposes of this document, impacts specific to fish and invertebrates would be considered significant if the Project would:

- Reduce quality and/or quantity of EFH as defined by the Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), causing adverse effects such as direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of or injury to benthic organisms, prey species and their habitat, and other ecosystem components if such modifications reduce the quality and/or quantity of EFH;
- Interfere substantially with the movement of any resident or migratory fish or impede the use of estuary or nursery sites;
- Introduce new, invasive, or disruptive aquatic species in the Project site;
- Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or State habitat plan; or
- Reduce fishing areas that have been historically important to the commercial and/or the recreational fishing industries such that regional fishery revenues are reduced from impacts on living marine resources and habitat.

### 4.7.3.3 Seabirds

For the purposes of this document, impacts specific to seabirds would be considered significant if the Project would:

- Cause injuries or mortalities to substantial numbers of non-listed seabirds;
- Cause injury or mortality to any seabirds listed as threatened or endangered;
- Interfere with or cause substantial deviations in the normal movements or migration routes of a significant numbers of seabirds; or
- Degrade the quality or availability of the marine environment locally to the extent that reproduction by non-listed or listed species of seabirds on the nearest islands (Anacapa and Santa Barbara Islands) is negatively affected or to the degree that it threatens to eliminate any seabird community or reduces the range of a threatened or endangered species.

### 4.7.3.4 Sea Turtles

For the purposes of this document, all impacts on sea turtles would be considered significant if the Project would:

- Substantially adversely affect, either directly or through habitat modifications, any species identified as a listed, candidate, sensitive, or special status species in local or regional plans, policies, or regulations or by the CDFG or USFWS; or
- Degrade the quality of the environment, substantially reduces the habitat of marine biota species, cause marine biota species to drop below self-sustaining levels, threaten to eliminate an animal community, or reduces the range of a rare or endangered species.

#### 4.7.3.5 Marine Mammals

For the purposes of this document, impacts specific to marine mammals would be considered significant if the Project would:

- Cause injury or mortality or results in an action that could be considered a Level A take under the MMPA (defined as any act of pursuit, torment, or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild);
- Cause a Level B take of a listed or candidate species or a Level B take of significant numbers of marine mammals (defined as harassment having the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering); or
- Cause substantial deviations (more than 1 NM [1.2 miles or 1.9 km]) of migration routes for significant numbers of marine mammals.

### 4.7.4 Impact Analysis and Mitigation

Applicant-proposed measures (AM) and agency-recommended mitigation measures (MM) are defined in Section 4.1.5, "Applicant Measures and Mitigation Measures."

**Impact BioMar-1: Burial of Sessile Marine Biota**

***Construction activities associated with pipeline and mooring installation could temporarily disturb soft substrate sediments and could bury or crush sessile marine biota such as benthic invertebrates (CEQA Class III; NEPA minor adverse, short-term).***

*Construction*

The installation of the offshore pipeline would cause a small and temporary increase in the amount of turbidity. Increased turbidity would cause a direct adverse impact on water quality (see Section 4.18.4) and both direct and indirect adverse impacts on marine life. Direct impacts on marine life would include potentially covering benthic organisms with a layer of sand or silt in the immediate vicinity of the pipeline and with fine silt and clay particles downcurrent from the pipeline. Indirect impacts would include effects on marine life from the degradation of water quality, such as reducing light penetration, discoloring the ocean surface, or interfering with filter-feeding benthic organisms sensitive to increased turbidity. These are potential violations of the water quality standards specified in the Ocean Plan and in the significance criteria (see Section 4.18.3).

Increased turbidity during pipeline and mooring installation activities could clog filter-feeding mechanisms used by some benthic organisms. During installation of the FSRU and pipeline, approximately 10 acres (4 ha) of seafloor would be disturbed, which would temporarily increase turbidity in the water column. The disturbance of seafloor sediments during the installation of the FSRU, mooring system, and offshore pipelines could degrade water quality because of an increase in turbidity. The temporary increase in turbidity could reduce light penetration, alter the ambient water chemistry such as pH and dissolved oxygen content, or interfere with filter-feeding benthic organisms sensitive to increased turbidity. Section 4.18, “Water Quality,” contains a detailed discussion of potential impacts from increased turbidity in the Project site.

The level of increase in turbidity resulting from offshore construction would depend on the equipment used, sediment grain size and settling rates, and bottom currents. In the area of the proposed FSRU, tidal currents vary from approximately 7.5 to 16 feet per minute (approximately 0.1 to 0.2 knots or 3.8 to 8.3 cm/s) and generally flow from the northwest to the southeast. In general, the northwest/southeast tidal current ranges in velocity from 4.5 to 8.8 feet per minute (0.044 to 0.087 knots or 2.3 to 4.5 cm/s), with the highest velocities 250 feet (76 m) beneath the surface (Münchow 1998). Bottom currents could be much stronger than surface currents (Dever 2004). In the northern Santa Monica Basin, within which the proposed FSRU site and offshore pipelines are located, below-surface current velocity can range from approximately 9.8 to 39.4 feet per minute (0.1 to 0.4 knots or 5 to 20 cm/s), depending upon depth and season (Hickey 1993).

According to the Fugro report, the proposed offshore pipeline route traverses dense sand and silty sand in the nearshore areas, sandy silts and silts near the shelf edge, and fine grain to clays on upper ridge slopes. The FSRU would be located in an area containing a thin clay layer overlying hard or dense turbidite deposits (Fugro 2004). Fine sands will settle approximately 1 meter (3.3 feet) in just a few minutes (or at a rate of approximately 0.6 cm/sec [0.02 feet/sec]), depending on grain size, and fine silts will settle at a rate of 1.2 meters (4 feet) per day or approximately 0.00139 cm/sec [0.000046 feet/sec] (USACE San Francisco District and Port of Oakland 1998). Clays would remain in suspension longer than the fine silts.

Recent analyses of turbidity plumes from burial of pipelines, which would likely have far greater impacts on water quality and marine life than the proposed action for Cabrillo Port, have concluded that adverse impacts from jetting/trenching would be short-term and minor (MMS 2006, USCG and MARAD 2006a, USCG and MARAD 2006b). A review of recent NEPA documents that have analyzed projects for which offshore pipelines would be installed in waters deeper than 200 ft (61 m) and would not require burial has shown that either turbidity impacts from laying a pipeline on the seafloor were not analyzed (MMS 2006) or that turbidity was considered a short-term minor adverse impact on water quality and marine life (USCG, MARAD and MEOEA 2006). Assuming that the bottom currents would serve to quicken settling of resuspended sediments, there is no reason to believe that proposed pipeline installation activities for Cabrillo Port would be any different than these other pipelines. The effects on benthic organisms from increased turbidity would be short-term and highly localized and therefore considered adverse but below its significance criteria.

A report entitled HDB Nearshore Pipeline Project Marine Operations has been developed by the Applicant and is provided as Appendix D3 of this document. The report provides detailed, preliminary data and information on the seafloor area that would be impacted as a result of HDB activities. HDB activities would include three marine equipment spreads: a nearshore/HDB pipelay spread, an HDB exit hole barge spread, and the deepwater pipelay spread. See Figures 2.6-3 and 2.6-4 in Chapter 2, "Description of the Proposed Action," for typical offshore layouts for HDB. Table 2.6-1 in Chapter 2 provides preliminary seafloor area calculations for areas impacted by the HDB activities near and offshore. The total length of seafloor impacted is approximately 5,330 feet (1,625 m) with a maximum width of 60 feet (18.3 m) for moorings. The total area of seafloor impacted by the HDB activities is approximately 149,400 square feet (13,900 $m^2$) or 3.43 acres (1.39 ha). Hard bottom habitats are not known to be present in this area (Fugro 2004).

Available literature indicates that drilling fluid forms lightweight flocs (masses resembling wool formed by the aggregation of a number of fine suspended particles) when it mixes with seawater. Direct measurements of seafloor frac-outs have demonstrated that, upon release, the warmer drilling fluid can extend upward into the cooler water column where buoyancy-induced turbulence disperses the drilling fluid, and currents transport the dilute mixture well away from the discharge point (Coats 2003). However, this tendency is more likely to occur in deeper water associated with oil and gas drilling. The temperature differential between the drilling fluid moving through relatively shallow formations under the sea floor is likely to be similar to that of the seawater. Therefore, buoyancy of escaped drilling fluid would be less upon exiting.

It is possible that a release of up to 10,000 gallons of bentonite would occur at the HDB exit hole. This is a conservatively high estimate and it is likely that the amount would be significantly less. While there is a concern that significant volumes of drilling fluid would be released when the HDB system exits the sea floor because of the hydrostatic head of the drill fluid column in the annulus, an HDB suction pump located near the cutting head has sufficient capacity to withdraw the majority of the anticipated drilling fluid volume as it flows toward the penetrated seafloor. Some drilling fluid would flocculate and disperse into an area near the exit point where divers would be located to vacuum the released material until it clears. Completion of HDB operations may require up to 108 days.

Once HDB operations are completed, installation of the offshore pipeline would begin. Offshore pipe pulling and pipelaying activities are projected to occur over a 35-day period. The impact area on the seafloor during installation of the subsea pipelines is 22.77 miles (36.64 km) long by 200 feet wide, or approximately 553 acres (224 ha).

Installation of the pipeline and mooring could disturb or directly harm (crush) benthic organisms that occur in soft bottom habitats within the Project footprint. Reestablishment rates for infaunal organisms occurring in deeper ocean areas are not well known. However, studies indicate that less consolidated coarse sediments in areas of high natural disturbance show fewer initial effects from disturbances. Because those habitats tend to be populated by opportunistic species, they would generally recolonize more rapidly (National Academies Press 2002). However, if bottom sediments are significantly changed from the natural sediments, organisms may be slow to reestablish in the area. The proposed activities would not change the character of the bottom sediments. Short-term impacts on the infaunal community are not likely to last more than 6 to 12 months (ABP Research 1999; Lindebroom and deGroot 1998). Only short-term, localized impacts on the infaunal community would be expected.

To mitigate potential impacts on seafloor organisms caused by turbidity during construction, the use of silt curtains was considered. Silt curtains control turbidity inside the curtain enclosure through use of impervious, vertical barriers that extend from the water surface to a specified water depth. They can be used in nearshore areas but are not effective in controlling turbidity in an open ocean environment due to strong currents and waves.

Because the impact is restricted to short-term, localized impacts on a limited area of seafloor within the linear pipeline footprint, recolonization is expected to occur rapidly. Once installed on the seafloor, the pipeline would be stationary and would not have any impacts on the infaunal community or those species dependent on these habitats. The impact on sessile marine organisms would be adverse, temporary, and would not exceed the significance criteria. Because impacts on benthic communities would be short term and benthic communities would rebound within a year, burial of sessile marine biota would be adverse but less than its significance criteria, and no mitigation measures would be required.

**Impact BioMar-2: Temporary Avoidance of the Area Due to Increased Turbidity from Construction Activities Offshore or Accidental HDB Release of Drilling Fluids**

***A release of drilling fluids and bentonite into the subtidal environment during HDB could temporarily increase turbidity. Increases in turbidity at the offshore exit point could cause fish to avoid this area and could cause adverse impacts on special status species and EFH (CEQA Class II; NEPA minor adverse, short-term).***

The primary adverse impact that could occur during HDB activities is an inadvertent release of drilling fluids directly into the ocean and subtidal waters, causing local increased, but temporary, turbidity. Although drilling fluids comprise naturally occurring, non-toxic materials (bentonite clay), the release of large quantities into the subtidal zone could affect fishes and other aquatic biota such as benthic organisms by settling and temporarily inundating habitats needed by these species. Additionally, turbidity near the Project site would increase from construction activities during installation of the FSRU moorings and the subsea pipelines. A release of up to 10,000 gallons of bentonite could occur at the HDB exit hole; however, this is a conservatively high estimate and it is likely that the amount would be significantly less. During the exit phase, the HDB drilling head suction pump, located near the cutting head, would be continuously operated and coordinated with divers on the seafloor to withdraw and control drilling fluid with light weight flocs from clouding the surrounding seawater.

Any increased turbidity in the water column would be localized and temporary, lasting approximately nine days for the FSRU drag-embedded anchor installation, 108 days for the HDB exit-hole excavation, and 35 days for the installation of the sub-sea pipeline. Impacts on fish and benthic species would be short-term and localized. Benthic communities would rebound within six months to a year in impacted areas. Monitoring, response, documentation, and notification, as noted within the HDB Plans provided in Appendix D, would minimize the potential environmental effects of the HDB operation and any potential releases of drilling fluids.

<u>Mitigation Measure for Impact BioMar-2: Temporary Avoidance of the Area Due to Release of Drilling Fluids</u>

The following measure would apply to this impact:

**MM WAT-3a.** **Drilling Fluid Release Monitoring Plan** would apply to this impact (see Section 4.18, "Water Quality and Sediments," and Appendix D1).

Overall impacts on fish and benthic communities would be negligible, considering the limited area impacted by a release event or by construction activities, and implementation of the proposed mitigation measure would reduce impacts to a level below its significance criteria. Implementation of this measure would minimize the potential for a release of drilling fluids during an accidental spill. If such a release were to occur it would be quickly identified and reported to the appropriate regulatory agencies which would respond to the spill reducing the spread of drilling fluids and reducing the size of the impacted area. Spilled drilling fluids would be removed to the extent possible. Therefore, the impact on marine species would be reduced to level less than the significance criterion.

**Impact BioMar-3: Temporary or Permanent Alteration or Disturbance of Marine Biota or Sensitive Habitats, including EFH.**

***Construction and/or operational activities could affect marine biota or alter EFH or sensitive habitats (beach spawning areas or hard bottom substrate), resulting in cessation or reduction of feeding or reproduction, area avoidance, or changes in migration patterns for both non-threatened and endangered and special status species (CEQA Class II; NEPA moderate or major adverse, short- or long-term).***

*EFH Assessment*

The FMPs describe EFH within State waters (shore to 3 NM [3.5 miles or 5.6 km]) and to the outer limit of the Exclusive Economic Zone (EEZ) (~200 NM [230 miles or 371 km]). The Project area is located in a subset of this area, the Southern California Bight, and therefore, the following text focuses on EFH and potential impacts on EFH within the Southern California Bight and within the Project area itself.

Proposed activities identified by NOAA (see Appendix I, December 20, 2004, letter from R. Schmitten) that could affect EFH for managed species described within the four FMPs include: (1) the accidental release of drilling muds, including bentonite into the subtidal environment nearshore pipeline installation, which would increase turbidity and cause species to avoid the area; (2) accidental oil, fuel or LNG spills that could occur during construction or operation that could kill marine fish and invertebrates; (3) discharge of bilge water, gray water, and deck runoff from the FSRU potentially resulting in weakening or killing marine fish and invertebrates due to contaminants; and (4) release of ballast water containing non-indigenous species, resulting in the introduction of invasive species, which could potentially affect the long-term viability of native species.

EFH has been identified for 89 species in the Pacific region covered by four FMPs: the Highly Migratory Species FMP, the Coastal Pelagics FMP, the Pacific Salmon FMP, and the Pacific Groundfish FMP, all under the auspices of the Federal PFMC.

The maintenance of a healthy and viable benthic community is recognized as critical to supporting most, if not all, of the fish species' life stage requirements, and impacts on benthic communities are included within the EFH assessment. Other specific habitats, such as kelp beds or natural hard-bottom substrates, are also important for early life stages in particular, but these specific habitats are not known to exist within the proposed Project area.

*Highly Migratory Species*

EFH for these species is described in the Highly Migratory Species FMP (Pacific Fisheries Management Council 2003a) by management unit species, as presented in Table 4.7-7a. No Habitat Areas of Particular Concern have been identified within this EFH at this time, but could be in the future, in particular for shark pupping and core nursery areas. However, based upon current EFH definitions, it is unlikely that Habitat Areas of Particular Concern such as shark pupping or core nursery areas would be identified in the vicinity of the Project area. Highly migratory species are pelagic (oceanic) and travel great distances to feed or and reproduce, which makes their EFH very difficult to define, especially as a group. In addition, the presence of highly migratory species depends on ocean temperature, current patterns, availability of food, and other factors, which vary seasonally and from year to year. Therefore, the FMP indicated a preference for defining EFH by management unit species, as summarized in Table 4.7-7a.

**Table 4.7-7a Description of EFH for Highly Migratory Species by Management Unit Species and Potential Project Impact on EFH**

| Management Unit Species | Early Life Stages (Eggs, Larvae and Early Juveniles) | Juveniles and Subadults | Adults | Potential Adverse Project Impacts During Normal Construction and Operation |
|---|---|---|---|---|
| Common thresher shark | Epipelagic, neritic and oceanic waters off beaches, in shallow bays and near surface waters from 6-100 fm (11-183 m) to 400 fm (732 m). Feeds on small schooling fishes and invertebrates. | Epipelagic, neritic and oceanic waters off beaches, in shallow bays and near surface waters from 6-1,400 fm (11-2,560 m). Feeds on northern anchovy, squid and pelagic red crab. | Epipelagic, neritic and oceanic waters off beaches, in shallow bays and near surface waters from 40-1,900 fm (73-3,475 m). Feeds on a variety of fish, squid and pelagic red crab. | Very minor and likely imperceptible, short-term impact on early life stages during construction. Minor, long-term impacts on juveniles, subadults and adults possible during construction and operation. |
| Pelagic thresher shark | No habitat within U.S. West Coast EEZ. | Epipelagic, oceanic waters from 100 fm (183 m) isobath to EEZ boundary. Prefers sea surface temperatures of 21°C or warmer. May feed on small schooling fish, squids. | Epipelagic, oceanic waters from 100 fm (183 m) isobath to EEZ boundary. Prefers sea surface temperatures of 21°C or warmer. May feed on small schooling fish, squids. | No impact on early life stages. Minor, short-term and long-term impacts on juveniles, subadults and adults possible during construction and operation. |
| Bigeye thresher shark | No habitat within U.S. West Coast EEZ. | Coastal and oceanic waters in epipelagic and mesopelagic zones, possible out to the 2,200 fm (4,023 m) isobath. May feed on pelagic fishes, squids. | Coastal and oceanic waters in epipelagic and mesopelagic zones, possible out to the 2,000 fm (3,658m) isobath. May feed on pelagic fishes, squids. | No impact on early life stages. Minor, short-term and long-term impacts on juveniles, subadults and adults possible during construction and operation. |
| Shortfin mako shark | Oceanic and epipelagic waters from 100-2,000 fm (183-3,658 m). Early juveniles may feed on small pelagic fishes. | Oceanic and epipelagic waters from 100 fm (183 m) to the EEZ boundary. Feeds on variety of fish, young shark, swordfish, squid. | Epipelagic waters from 400 fm (732 m) to EEZ boundary. Feeds on variety of fish, shark, swordfish, squid. | Minor, short-term and long-term impacts on early life stages, juveniles, subadults and adults possible during construction and operation. |
| Blue shark | Epipelagic, oceanic waters from 100 fm (183 m) to EEZ boundary. Diet or early juveniles unknown. | Epipelagic, oceanic waters from 100 fm (183 m) to EEZ boundary. Feeds on variety of fish, squids, krill. | Epipelagic, oceanic waters from 200 fm (366 m) to EEZ boundary. Feeds on variety of fish, squids and krill. | Minor, short-term and long-term impacts on early life stages, juveniles, subadults and adults possible during construction and operation. |

**Table 4.7-7a Description of EFH for Highly Migratory Species by Management Unit Species and Potential Project Impact on EFH**

| Management Unit Species | Early Life Stages (Eggs, Larvae and Early Juveniles) | Juveniles and Subadults | Adults | Potential Adverse Project Impacts During Normal Construction and Operation |
|---|---|---|---|---|
| Albacore tuna | No habitat within U.S. West Coast EEZ. | Epipelagic, oceanic waters from 100 fm (183 m) to EEZ boundary. Feeds on small fishes, squids and crustaceans. | Epipelagic, oceanic waters from 100 fm (183 m) to EEZ boundary. Feeds on fish and squid. | No impact on early life stages. Minor, long-term impacts on juveniles, subadults and adults possible during construction and operation. |
| Bigeye tuna | No habitat within U.S. West Coast EEZ. | Concentrated in Southern California Bight from 100-1000 fm (183-1,829 m). Diet unknown. | Concentrated in Southern California Bight from 100-1000 fm (183-1,829 m). Diet unknown. | No impact on early life stages. Minor, short-term and long-term impacts on juveniles, subadults and adults possible during construction and operation. |
| Northern bluefin tuna | No habitat within U.S. West Coast EEZ. | Epipelagic, oceanic waters from 100 fm (183 m) to EEZ boundary. Feeds on anchovy, squid and pelagic red crab. | No regular habitat within U.S. West Coast EEZ. | No impact on early life stages. Minor, short-term and long-term impacts on juveniles and subadults possible during construction and operation. |
| Skipjack tuna | No habitat within U.S. West Coast EEZ. | No habitat within U.S. West Coast EEZ. | Oceanic, epipelagic waters from 400 fm (732 m) isobath to EEZ boundary. Concentrated in the Southern California Bight. Feeds on crab, anchovy, krill, saury, squid. | No impact on early life stages, juveniles or subadults. Minor, short-term and long-term impacts on adults possible during construction and operation. |
| Yellowfin tuna | No habitat within U.S. West Coast EEZ. | Epipelagic, oceanic waters from 100 fm (183 m) to EEZ boundary. Feeds on pelagic red crab and anchovy. | No regular habitat within U.S. West Coast EEZ. | No impact on early life stages or adults. Minor, short-term and long-term impacts on juveniles and subadults possible during construction and operation. |
| Striped marlin | No habitat within U.S. West Coast EEZ. | No regular habitat within U.S. West Coast EEZ. | Oceanic, epipelagic waters from 200 fm (366 m) isobath to EEZ boundary. Feeds on various fish, squid, crab. | No impact on early life stages, juveniles or subadults. Minor, short-term and long-term impacts on adults possible during construction and operation. |

**Table 4.7-7a Description of EFH for Highly Migratory Species by Management Unit Species and Potential Project Impact on EFH**

| Management Unit Species | Early Life Stages (Eggs, Larvae and Early Juveniles) | Juveniles and Subadults | Adults | Potential Adverse Project Impacts During Normal Construction and Operation |
|---|---|---|---|---|
| Swordfish | No habitat within U.S. West Coast EEZ. | In the Southern California Bight from the 400 fm (732 m) isobath to the EEZ boundary. Diet opportunistic on suitable-sized prey fish species. | Offshore from the 400 fm (732 m) isobath. Diet opportunistic on suitable-sized prey fish species. | No impact on early life stages. Minor, short-term and long-term impacts on juveniles, subadults and adults possible during construction and operation. |
| Dorado/ dolphinfish | No habitat within U.S. West Coast EEZ. | Oceanic waters offshore of the 6 fm (11 m) isobath. Prefers sea surface temperatures of 20°C. Feeds on small flying fish, crustaceans, squid. | Oceanic waters offshore of the 6 fm (11 m) isobath. Prefers sea surface temperatures of 20°C. Feeds on flying fish. | No impact on early life stages. Minor, short-term and long-term impacts on juveniles, subadults and adults possible during construction and operation. |

*Source*: Pacific Fisheries Management Council 2003a.
*Notes:* EEZ = Exclusive Economic Zone; fm = fathoms.

Highly migratory species are expected to pass through the proposed Project area (pipeline and FSRU), but are not expected to depend exclusively upon the Project area for either feeding or reproduction. The highly migratory species managed by the PFMC potentially occurring within or near the proposed Project site are listed below:

- Tunas: albacore (all life stages), bigeye (juvenile and adult), northern bluefin (juvenile and adult), skipjack (adult), yellowfin (juvenile);
- Billfish/swordfish: broadbill swordfish (juvenile and adult);
- Dolphinfish/dorado/mahi mahi (juvenile, subadult, and adult); and
- Sharks: common thresher shark (all life stages), bigeye thresher shark (late juveniles and adults), shortfin mako shark (all life stages), blue shark (all life stages).

Because of their transient nature, the fact that most management unit species do not have very early life stage habitat within the West Coast EEZ, and also that no Habitat Areas of Particular Concern have been identified within the EFH for highly migratory species, the proposed Project would be expected to have few, if any, adverse, short-term and long-term impacts on EFH for highly migratory species. Any adverse impacts would be minimized by mitigation measures presented below.

*Coastal Pelagic Species*

EFH is described for coastal pelagic species in the Coastal Pelagic Species FMP (PFMC 1998), and accommodates the influence of surface water temperatures on coastal pelagic finfish distribution. EFH for coastal pelagic species in the vicinity of the Project area is defined as all marine and estuarine waters from the coastline to the West Coast EEZ boundary, and for adults, in the upper, mixed layer of the ocean where the sea surface temperature range is 10 to 26°C (PFMC 1998). Shallow and brackish waters may contain coastal pelagic fish, but they are not dependent upon these habitats. Coastal pelagic species are expected to occur in the vicinity of the proposed Project site during all life stages.

Coastal pelagic species managed by the PFMC include northern anchovy, market squid, Pacific bonito, Pacific saury, Pacific herring, Pacific sardine, Pacific (chub or blue) mackerel, and jack (Spanish) mackerel. Each of these species typically occurs in nearshore schools. Much of the jack mackerel range lies outside the ~200 NM [230 miles or 371 km]) EEZ, although small jack mackerel are often found near the mainland coast and islands and over shallow rocky banks.

The proposed Project would be expected to have a minor, adverse, short-term and long-term impacts on EFH for coastal pelagic species. Any adverse impacts would be minimized by mitigation measures presented below.

*Pacific Coast Groundfish*

EFH is described for Pacific Coast Groundfish and associated species in the Pacific Coast Groundfish FMP (Pacific Fisheries Management Council 2003b). In summary, this EFH occurs within seawater depths less than 1,914 fathoms (3,500 m) and seamounts in waters over 1,914 fathoms (3,500 m) coastward to the mean high water level or upriver extent of saltwater intrusion (in salinities higher than 0.5 parts per thousand). In addition, Pacific Coast Groundfish EFH occurs at areas designated as Habitat Areas of Particular Concern, which include: estuaries, floating kelp beds, seagrass, rocky reefs, areas of interest (seamounts, specific areas in Federal waters of the CINMS and Cowcod Conservation Area), and waters associated with oil production platforms (including Platforms Gail, Gilda and Grace) (Pacific Fisheries Management Council 2003b). Species covered under the Pacific Coast Groundfish FMP are expected to occur in the vicinity of the proposed Project site during all life stages.

Groundfish and associated species covered by the PFMC's Pacific Coast Groundfish FMP include 82 species that, with a few exceptions, live on or near the bottom of the ocean (Pacific Fisheries Management Council 2003b). These include:

- Rockfish: the FMP covers 64 species;
- Flatfish: the FMP covers 12 species;
- Groundfish: the FMP covers six species, including lingcod, cabezon, kelp greenling, Pacific cod, Pacific whiting, and sablefish;

- Sharks and skates: the FMP covers six species, including the leopard shark, soupfin shark, spiny dogfish, big skate, California skate, and longnose skate; and
- Other species: ratfish, finescale codling, and Pacific rattail grenadier.

Although many of the Habitat Areas of Particular Concern associated with this EFH occur in the Southern California Bight, several do not occur in the Project area or its immediate vicinity, i.e., floating kelp beds, seagrass, rocky reefs, or oil platforms. Therefore, the proposed Project would be expected to have a minor, adverse, short-term and long-term impact on species and EFH covered by the Pacific Coast Groundfish FMP. Any adverse impacts would be minimized by mitigation measures presented in Section 4.7.4.

*Pacific Coast Salmon*

The only salmon species found in Southern California is the chinook or king salmon. The EFH for chinook salmon extends from the Canadian border to Point Conception in California (Pacific Fisheries Management Council 2000). There is no designated freshwater chinook salmon EFH in Southern California. Although the southern EFH ends at Point Conception, chinook salmon periodically migrate as far south as Baja California, Mexico. Adult chinook salmon can be found off the Ventura coast from approximately the end of March to the end of September. In some years, when water temperatures are too warm and schooling baitfish are not plentiful, adult chinook salmon will only migrate as far south as Central California.

The proposed Project would not be expected to have an impact on EFH for chinook salmon, and NOAA did not include chinook salmon or its EFH within their consultation letter and mitigation recommendations (see Appendix I, December 20, 2004, letter from R. Schmitten).

*Construction*

<u>Hard Bottom Habitats</u>

The BHP Billiton Pipeline and Anchorage Area Study (Fugro Pelagos 2004) summarizes the multi-phase site investigation conducted to identify the optimal site for the proposed Project. The primary components of the site investigation included multibeam echosounder bathymetry mapping, acoustic imagery mapping, shallow penetration, high-resolution geophysical surveying, and seafloor sampling. According to the Fugro report, the proposed pipeline route traverses areas containing surficial soils consisting of dense sand and silty sand in the nearshore area, sandy silts and silts near the shelf edge, and fine grain to clays on the upper ridge slopes. The FSRU mooring would be located at approximately latitude 33º51.52’N and longitude 119º02.02’W, above the lower Hueneme Fan in areas that are hummocky to flat and contain a thin clay layer overlying hard or dense turbidite deposits (Fugro 2004). These surveys of the entire pipeline route and FSRU anchorage area were conducted between June 2003 and January 2004, (as defined in Chapter 2, “Description of the Proposed Action”), and indicated that hard substrate habitats do not occur within the Project site (Fugro 2004).

As such, fish or other marine biota that rely on hard bottom habitats would not be affected by the proposed Project. Managed species with EFH in the Project site, such as coastal pelagics and highly migratory species, may be disturbed or displaced during construction activities, including installation of the subsea pipelines or mooring of the FSRU. These species are highly mobile and would be able to avoid the Project area during pipeline installation. Species temporarily avoiding the area during construction are expected to return once installation activities have been completed. Adverse impacts on managed species with EFH in the Project area would be temporary and would not exceed the significance criteria.

<u>Noise</u>

Noise from construction could also potentially affect fish and other marine biota, causing them to leave the Project site or adjacent areas. The existing sound levels 12.01 NM (13.83 miles or 22.25 km) offshore vary, depending on weather conditions and ship traffic. As discussed in Section 4.3, "Marine Traffic," more than 5,000 commercial vessels transit the area annually. Fishing and recreation vessels also are found in the area. Noise generated by vessel traffic and other installation activities could cause avoidance behaviors in fish within the area and surrounding areas. Fish appear to be very sensitive to noise, particularly at low frequencies, however; sensitivity appears to be dependent upon distance. Some fish are attracted to, and even pursue, boats and are seemingly not adversely affected by boat noise. Low-level, constant, and "predictable" noises, e.g., constantly running generators, would allow those species unable to tolerate the noise to move some distance to lessen the perceived effect. Impulse sounds that are intermittent (and therefore unpredictable), and those at levels that could damage hearing or other organs, e.g. sonar pulses and blasting, are not part of the proposed Project.

The nearby waters of the CINMS are heavily ensonified (containing radiated noise) by anthropogenic noise (caused by humans). The natural background noise levels in the undisturbed ocean vary from around 90 decibels (dB) to 110 dB, depending on ambient weather conditions (Entrix 2004 [see Appendix H2]). Noise impacts on fish and other marine biota during construction activities would be temporary, only occurring during these activities, and would not exceed the significance criteria.

Bird hearing is thought to be intermediate between reptiles and mammals, and bird hearing sensitivity falls within the range for humans. While few techniques are available to determine bird hearing capability, the data that are available show roughly similar capabilities among species. At least one species, parakeets, showed much less threshold shift than found in mammalian ears, supporting the idea that birds are relatively immune to acoustic trauma from loud noises. For parakeets, no sensory cell loss was shown even at the highest levels of experimental sound exposure (Dooling 1980). Behavioral tests of bird hearing have also provided evidence of the extent to which hearing is regained following hair-cell regeneration. As for humans, noise can damage the hair cells, but hair cell regeneration appears to result in almost complete recovery of absolute thresholds (Dooling et al. 2000).

Lighting

As required by the USCG, vessels required for pipeline construction would display lights during nighttime hours for safety purposes. Pipelaying vessels and barges would be positioned offshore for approximately 20 days for the FSRU mooring activities, 60 days for the HDB shore crossing, and 35 days for installation of the offshore pipeline. Activities would occur 24 hours per day, seven days per week. Nighttime construction of the pipeline offshore and nearshore would require pipelaying barges, tug/supply vessels, and cranes, all of which would be equipped with lights. Table 4.4-3 in Section 4.4, "Aesthetics," summarizes lighting requirements during offshore construction, including the type, number, and proposed shielding for each source. Although marine species (plankton, fish, and birds) may be attracted to the offshore construction area, due to the temporary and transient nature of the lighting used on the vessels during offshore construction activities, no significant impacts are anticipated.

Grunion Spawning

The CDFG Code defines "grunion" as a fish, larvae, or egg. Any take of a grunion during April or May is prohibited. Grunions leave the water at night to spawn on the beach in the spring and summer months two to six nights after the full and new moons. Spawning begins after high tide and continues for several hours. Spawning occurs from March through August and occasionally in February and September. The peak spawning period is between late March and early June. The shore crossing beneath the sandy beach and nearshore areas of Ormond Beach would be installed using HDB and would avoid direct adverse effects on grunion beach spawning. However, if a release of drilling fluids and bentonite were to occur, depending on the location and size of the release, grunion spawning could be impacted. This potentially significant adverse impact would be eliminated or reduced to below the significance criteria through the mitigation measures identified below.

*Operation*

Noise

Understanding how various noise measurements are used to assess potential impacts from a project is vital to effective mitigation. Underwater sound levels are often expressed in decibels, which represent the *intensity* of sound. The decibel scale is not linear, meaning that 200 dB would not be twice as loud as 100 dB; instead, it is logarithmic. For every 3 dB increase, the sound intensity doubles. Decibels have no relevance without a reference pressure, however. The micropascal (µPa) is a unit of pressure often applied to sound levels. One micropascal equals one-millionth of a pascal, and one pascal equals a 1-newton force exerted over 1 $m^2$. Underwater sound levels are often expressed as X dB re 1 µPa, while sounds in air are expressed as X dB re 20 µPa.

Underwater sound levels expressed as X dB re 1 µPa represent the *peak* sound pressure level or power of a sound. Such measurements are useful in assessing potential impacts at close range from impulsive sound sources such as detonations, which are of very brief durations near the source. Impulsive sounds can also be expressed in pounds per square inch (psi) per milliseconds (ms). This provides a measure of the peak pressure above that of the ambient pressure at a given depth. This measurement assesses the peak pressure over the period of an impulse, thus providing a measure of how long and how much pressure is applied to an animal. Impulse measurements typically are used to assess potential impacts from large detonations some distance out from the source. Impulsive noises, such as those generated by explosives, are not anticipated for this Project.

Underwater sound pressure levels also are sometimes expressed as X dB re 1 µPa – m, which represents the theoretical peak sound pressure level within 3.3 feet (1 m) of the source. Such a measurement, called the source level, is useful for estimating sound pressure levels at various ranges from the source.

Another measurement, which represents the *average* peak pressure over the duration of a sound, such as a pulse generated by a geophysical airgun or continuous sounds from a vessel, is expressed as X dB re 1 µPa – root mean square [rms])). This measurement is obtained by squaring the pressure signal, summing these squares over a time interval, then dividing by the number of samples in the sum and taking the square root of the result. This provides an average of the acoustic time series that tends to emphasize the large-amplitude samples, since squaring increases their weight in the average. Selecting a time interval that is representative of the complete sound is very important in this type of measurement. This form of measurement is most appropriate for this Project, which involves continuous or comparatively lengthy intervals of sound rather than brief, concussive impulses.

*Noise Frequencies*

Peak pressure measurements (see previous section) are less useful at long ranges, especially when very loud sounds, such as those generated by large detonations, are involved, because such measurements do not express the frequencies with which an overpressure is applied to an animal over time. The peak pressure level of the most intense component in the frequency domain can be expressed in dB re 1 µPa$^2$ – s (decibels referenced to one micropascal squared per second). This is known as the sound energy level (SEL). SEL measurements are often used to assess potential impacts for loud impulsive sounds.

The FSRU is stationary and would produce a relatively constant, continuous underwater noise signal. Additionally, the slow approach of LNG carriers to the FSRU would likely produce a similar steady signal that would increase as they approach the FSRU. It is anticipated that underwater noise generated from the FSRU during normal operations, approximately 182 dB re 1 µPa – rms or less at the source (see Operation Scenarios, Cases 1 to 4 on Table 4.7-13 below), would attenuate to approximately 120 dB re 1 µPa – rms within 0.9 NM (1.0 miles or 1.6 km) of the FSRU and to minimum background noise levels at approximately 90 dB re 1 µPa – rms within 21.6 NM (24.9 miles or 40 km) of the FSRU. For less common or unlikely operational scenarios (Cases 5 to 7), noise impacts could be higher and reach farther from the source than the normal operations. During these operational scenarios, noise generated from the FSRU would attenuate to 120 dB re 1 µPa – rms within 9.7 NM (11.1 miles or 17.9 km) and to minimum background noise levels at between 29.2 and 70.2 NM (33.6 and 80.8 miles or 54 and 130 km). In general, it is anticipated that the normal operation of the FSRU and LNG carriers would not likely produce startle or alarm reactions in fish. Potential impacts on marine mammals are discussed in Impact BioMar-5.

Lighting

Operation of the FSRU would require the use of various types of lighting. Lighting onboard the FSRU would be designed to minimize nighttime impacts and would be used only to ensure safety and security and when operations require lighting. Movement sensors would be employed where practicable, and floodlight use would be minimized. Where used, floodlights would employ high efficiency, low-glare fittings, such as sodium and metal halide types. Table 4.4-3 in Section 4.4, "Aesthetics," summarizes offshore lighting requirements during Project operation. The purpose of illuminating the FSRU is to enhance its visibility and lessen the potential for accidents and collision. Accordingly, diminishing lighting to lessen potentially adverse effects on birds and other marine life would increase the potential for collision or other accident that could result in much more significant environmental harm.

During operation, lights would be in use during evening and night hours on the FSRU and supply vessels. As allowable under the Deepwater Port Act, the brightest onboard light would be a rotating beacon at the highest, unobstructed point on the vessel; this light would flash at least once every 20 seconds and would be positioned to be visible all around the horizon. This light would be required to have an effective intensity of at least 15,000 candelas. In comparison, this is a fairly low light output; a typical high beam on an automobile has an intensity of about 100,000 candelas. All other lighting on the vessel would not interfere with the range and arc of visibility of navigational lighting and therefore would be of significantly lower luminous intensity (candela). A typical light-emitting dioade (LED) marine beacon, achieving between 1,500 and 2,800 candelas, has a range of 6 to 10 NM (6.9 to 11.5 miles or 11.1 to 18.5 km).

The offshore pipelines would be buried, and lighting would not be required unless repair or maintenance is necessary during night hours. In this event, a repair vessel would be temporarily present. Lighting may be used to aid in the repair but likely would not be used for extended periods of time.

The distribution of marine organisms depends on the chemical and physical properties of seawater (temperature, salinity, and dissolved nutrients), on ocean currents (which carry oxygen to subsurface waters and disperse nutrients, wastes, spores, eggs, larvae, and plankton), and on penetration of light. Photosynthetic organisms (plants, algae, and cyanobacteria), the primary sources of food, exist only in the photic, or euphotic, zone (to a depth of about 300 feet [91 m]), where light is sufficient for photosynthesis. Bright lights are known to attract numerous marine fauna, starting with plankton and then rippling across the food web to include small schooling fish and squid. These in turn attract larger predators, including fish and seabirds, rendering each in turn vulnerable to other predators and to other Project-related impacts.

There is some indication that certain levels of lighting will attract fish. Fishes may be attracted by any platform's nighttime light-field and/or concentrations of prey that may be found in the waters around platforms (Shaw et al. 2002). The FSRU is not a static structure (like a platform) but would "weathervane" around its mount. However, it would be moored to the seafloor and would remain within a certain area, restricted by the moorings and as it is affected by the offshore currents. As a result, it is likely that the FSRU lights would attract marine organisms.

Lighting is a known deterrent to nesting adult sea turtles, and lighting can result in avoidance of nesting beaches. Conversely, lights have been shown to attract hatchling sea turtles, which can cause mortality by causing hatchlings to leave the nest and to move inland, away from the ocean. With the exception of the leatherback sea turtle, which ranges from Chile to Alaska, the proposed Project site lies beyond the breeding and feeding grounds of sea turtles. No leatherbacks have been reported at or near the proposed Project site. Because of the low numbers of sea turtles occurring in or near the Project site and the lack of nesting beaches in the Project vicinity, impacts on sea turtles from FSRU operational lighting would not occur.

Most seabirds are also very wide-ranging. Nesting and breeding take place on land, so no impacts on reproductive habitat would occur. The feeding grounds of seabirds generally range over very large areas so no measurable impacts on feeding areas or prey are anticipated. Birds can become disoriented and attracted to illuminated structures at sea or on land, and occasionally seabirds land on boats illuminated at night, apparently disoriented. Migrating birds also can become disoriented and can either continually fly around illuminated structures or collide with them. A number of seabird species are known to be attracted to bright lights at night. Such animals sometimes collide with lighted objects, causing them to become stunned, injured, or killed. When they are stunned or injured, they generally fall back into the water, where they fall prey to other seabirds such as gulls and other predators. Xantus's murrelet (*Synthiloboramphus hypoleucus*), a threatened species under the California ESA and a Federal candidate, may be subject to offshore lighting impacts. However, studies indicate very low mean densities of Xantus's murrelet (between 0.04 and 0.1 birds per $km^2$) offshore in the CalCOFI sampling around the Channel Islands (Ainley et al. 1995; Mills et al. 2005). Other species that may be subject to offshore lighting impacts include night-foraging storm petrels and alcids including, the ashy storm petrel (*Oceanodroma melania*) and the rhinoceros auklet (*Cerorhinca monocerata*), which are California species of special concern. Studies show that rhinoceros auklets are found offshore between 0.02 and 0.14 bird per $km^2$.

Low densities of birds, including Xantus's murrelets, are expected in the area of the FSRU; in addition, given the distance between FSRU and island habitats encounters are expected to be infrequent. The required beacon light would be less visible than the lighting on offshore platforms in the Santa Barbara Channel. In addition, commercial vessels transiting the Project site at night are also lit. While the overall effect of night lighting on birds is biologically significant, the illumination from the FSRU alone would not be a substantial light source that would adversely impact sensitive marine bird species—given its distance from bird concentration areas, its low lighting magnitude, the shielding and directionality of the lighting (see AM BioMar-3a) and its duration on passing birds (as opposed to impacts on birds on nesting structures that would suffer constant exposure). The Applicant proposes to take all practical measures to minimize the amount of total lighting used on the proposed Deepwater Port while maintaining compliance with safety requirements.

Ichthyoplankton

**Impingement and Entrainment.** Impingement or entrainment of marine organisms during seawater uptakes on the FSRU or LNG carriers could adversely impact fish species or EFH in the Project site. Impingement can occur when fish and other aquatic life are trapped against seawater intake screens. Entrainment can occur when aquatic organisms, eggs, and larvae are drawn into a water system, and then pumped back out. Seawater is used aboard the FSRU for several operational functions including fire systems, cooling systems and ballast water. Ballast water exchange is required to maintain the balance and floating depth (draft and trim[1]) of the FSRU and the LNG carriers when loading or unloading cargo, e.g., when LNG carriers are unloading LNG to the FSRU. The LNG carriers and the FSRU load/discharge seawater to/from ballast tanks via a system of dedicated pumps, pipelines, and valves that together comprise the ballast system. This piping system begins at through-hull opening fittings and recesses in the hull that act as reservoirs from which piping systems draw seawater (called "sea chests"), which are connected via pipelines and valves to the ballast pumps. The exchange of ballast water would occur at the bottom of the FSRU's hull at a depth of approximately 42.7 feet (13 m).

The arrangement, location, and depth of the sea chests and uptake valves are designed to provide short pipe runs to the pumps along with other considerations of pump efficiency and capabilities. Such designs are based on common practice in LNG carrier and FPSO design (WorleyParsons 2006a, see Appendix D5). Alternatives to the proposed ballast water systems, including reusing ballast water and storing ballast water in submerged or semi-submerged tanks, were analyzed and deemed impractical and unrealistic, based on the engineering and operational requirements of the proposed Project. Additional details of this analysis are contained in the WorleyParsons report (2006a, see Appendix D5).

A detailed discussion of the proposed ballast water and other seawater uptake systems is provided in Section 2.2.2.4, "Utilities Systems and Waste Management." The following information is provided as a summary for the purposes of analyzing potential impacts on EFH and ichthyoplankton. The proposed ballast pump configuration provides a maximum pumping capacity of 1.59 million gallons (6,000 cubic meters [$m^3$]) of water per hour. Ballast water intakes would be screened and flow rates maintained per the Federal Clean Water Act § 316, i.e., flow rates of less than 0.5 feet per second

[1] Draft is the depth of a vessels keel below the water's surface; trim is the vessel's balance.

(0.15 meter [m] per second),[2] to minimize impingement of aquatic organisms. A typical sea chest inlet design is fitted with an external coarse filter grill with grading clearance spacing of 1 inch (2.5 centimeters [cm]) to prevent large matter from being taken in and/or blocking the intake systems and to prevent organic matter accumulating in the sea chests and ballast tanks. Further downstream from the grill, a secondary fine filter would be fitted in place with a screen size of approximately 0.25 inches (0.6 cm). This screen would prevent the intake of some marine matter or organisms, e.g. those larger than 0.25 inches (0.6 cm), and could be accessed for cleaning. These screen sizes are based on preliminary engineering designs and common practice in LNG carrier and FPSO design and are approximate. It may be possible to adjust the screen sizes if it would not adversely affect other essential systems. Tables 4.7-8a and 4.7-8b provide a summary of the seawater uptakes required for operation of the FSRU and LNG carriers that were evaluated in the ichthyoplankton impact analysis.

As discussed above, operational and maintenance activities on the FSRU would require the use and uptake of seawater. Although specific design plans have not been finalized, a typical vessel of this type would have several seawater uptake systems, including eight sea chests and six seawater intakes. All six intakes would be at a depth of approximately 42.7 feet (13m) and would maintain flow rates of less than 0.5 feet (0.15 m) per second.

The 4.17 million gallons (15,785 $m^3$) per day of seawater uptake which is a weighted average proposed for the Cabrillo Port Project are significantly (orders of magnitude) lower than typical volumes used by other LNG or a power generation facility's cooling systems, both nearshore and offshore and 60% lower than the seawater uptake values presented in the March 2006 EIS/EIR. For example, cooling water intake structures used on many nearshore power generating plants in California are designed to withdraw well over 50 million gallons (189,250 $m^3$) of seawater per day (California Energy Commission 2005). Some facilities (for example, the Moss Landing Power Plant and Ormond Beach Power Plant) can use between 562 and 864 million gallons (2,127,401 and 3,270,596 $m^3$) per day (California Energy Commission, 2004). Additionally, the intake valves for many of these facilities are located in nearshore or estuary environments where ichthyoplankton densities can be higher than offshore locations.

[2] Although earlier Project designs (see Ballast Water System Operations and Design Features, Appendix D-5) predicted velocity requirements of up to 3fps, further design and analysis has determined that seawater intake velocities under 0.5 fps are achievable and will be implemented for the proposed Project.

**Table 4.7-8a Seawater Uptake Volumes**

| Source | Total Volume in Gallons (provided by BHPB) | Uptake Rate | Frequency | Average Total Volume (MGD) | Average Total Volume (MGW) | Total Volume (MGY) |
|---|---|---|---|---|---|---|
| Scenario 1 - Ballast Water operating at 800 MMscfd | 163,750 /hour | 2,729 gpm | 322 days per year | 3.93 | 27.51 | 1,265.46 |
| Scenario 3 – Ballast Water and Inert Gas Generator (IGG) operating at 1200 MMscfd | 680,625 /event | 11,343 gpm | 4 days per year | 16.33 | NA | 65.32 |
| Weighted Average of Scenarios 1 and 3 (3.93 MGD and 16.33 MGD) | 173,750 /hour | 2,895 gpm | 326 days per year | 4.17 | 29.19 | 1,359.42 |

**Table 4.7-8b. Additional (Negligible) Seawater Uptakes**

| Source | Total Volume in Gallons (provided by BHPB) | Uptake Rate | Time Period | Frequency | Average Total Volume (MGD) | Average Total Volume (MGW) | Total Volume (MGY) |
|---|---|---|---|---|---|---|---|
| Fire Pump Testing | 85,854 /event | 5,723 gpm | 15 minutes | once/week | 0.01 | 0.08 | 4.12 |
| Main Fire System Test | 105,700 /year | unknown | unknown | once/year | 0.00 | 0.00 | 0.11 |
| **TOTALS** | | | | | **0.01** | **0.08** | **4.23** |

*Source:* WorleyParsons 2006.

*Notes:* MGD = million gallons per day; MGW = million gallons per week; MGY = million gallons per year.

Results have been rounded to reflect the appropriate level of scientific accuracy. Negligible differences in volume totals may result due to rounding with additional calculation.

An ichthyoplankton impact analysis was developed to determine potential impacts of the proposed Project. The complete report is provided in Appendix H1 of this document. The results of the analysis indicate that the daily mortality for eggs would be approximately 42,704 eggs and 7,614 larvae per day, representing <0.00000019 percent of the 21,464,100,000,000 eggs and 3,824,100,000,000 larvae found within the Project site.

In addition to the weighted average, the minimum and maximum operating conditions were also evaluated for comparative purposes. The minimum operating condition assumed operations 322 days per year and a seawater intake of approximately 3.93 million gallons per day. This resulted in entrainment values of approximately 40,169 eggs and 7,162 larvae per day. The maximum operating condition assumed operations 4 days per year and a water intake of approximately 16.33 million gallons per day. This resulted in entrainment values of approximately 166,963 eggs and 29,768 larvae per day.

Based on the CalCOFI data used in this assessment, species managed by the Pacific Fishery Management Council make up approximately 49,713,300 larvae or 0.000013 percent of the total larval density and 214,641,000 eggs or 0.000010 percent of the total egg density estimated to be present in the source water body. Based on the small numbers of these species expected to be entrained in the seawater uptake systems, the impacts on these species would be less than significant (see Section 4.7 for further information on impacts on managed fish species). See Appendix H1 for the ichthyoplankton analysis.

Impacts on ichthyoplankton can be difficult to interpret due to the low natural survival rates of fish eggs and larvae. In fact, many (84.9 percent) of the entrained organisms are eggs, which are subject to high rates of natural mortality. Although no consensus currently exists within the scientific community or responsible agencies regarding the level of impacts on ichthyoplankton that is considered significant, the density of ichthyoplankton within the Project site represents typical low-level values expected in offshore areas, and specifically in the Project site, where upwelling events are limited compared to other areas within the Southern California Bight.

In order to determine whether changing the depth of the intake valve would actually reduce entrainment impacts for the proposed Project, species occurrence and densities at alternative depths within the water column were investigated. To analyze the potential impacts at various depths, vertical distribution data are required. A literature search was performed to identify all available data, including additional consultation with the CalCOFI. Table 4.7-9 shows data for vertical distribution available in the literature for managed species with EFH in the Southern California Bight. A more detailed table containing all of the vertical distribution data found in the literature is provided in the ichthyoplankton analysis (Appendix H1). Vertical distribution data are only available for 29 species out of the 113 species identified in the ichthyoplankton analysis. Despite the availability of some limited information, the data do not provide sufficient information to fully assess potential impacts at alternative depths.

**Table 4.7-9 Summary of Vertical Distributions of Selected Managed Species with EFH in the Southern California Bight.**

| Scientific Name | Common Name | Depth Species Found (meters/feet) |
|---|---|---|
| *Sebastes spp.* | rockfish species | 75-150 m (246-492 feet),[a] generally found above the pycnocline, but highly variable;[e] larvae typically occurred in the upper 80 m, highest densities were in the 40 to 80 m (131 to 262 feet) stratum offshore, with extremely low densities in the upper 30 m (98 feet)[b]. |
| *Engraulis mordax* | Northern anchovy | peak concentration at 25-50 m (82-164 feet)[a]; a range of size classes were found at all depths (surface, mid-water and bottom)[d]; 90-95% of eggs and larvae in upper 30 m (98 feet), average egg density at the upper 14 cm was more than double that in the 0-10 m (0-33 feet) stratum[b] |
| *Merluccius productus* | Pacific hake | not present in samples[a]; all strata down to 250 m (820 feet), most eggs between 50-100 m, early stages between 75-150 m, late stages 50-100 m (164-328 feet)[c]; larvae typically occurred in the upper 80 m, although some distribution down to 120 m (394 feet)[b]. |
| *Scomber japonicus* | chub mackerel | upper 100 m (328 feet), highest concentrations 25-50 m (82-164 feet)[a] |
| *Sebastes jordani* | shortbelly rockfish | most abundant at both 20-40 m (66-131 feet) and 60-90 m (197-295 feet) during the day, 20-40 m (66-131 feet) dawn and dusk, 40-60 m (131-197 feet) at night[e] |

*Sources:*
[a] Moser and Smith 1983.
[b] Moser and Pommeranz 1999.
[c] Moser, Lo, and Smith 1997.
[d] Schlotterbeck and Connally 1982
[e] Sakuma, Ralston, and Roberts 1999.

However, the data do indicate that species occur at various depths and exhibit widely varied seasonal distributions and migration patterns in the water column. For example, Pacific hake was identified in one study at all strata down to 250 m (820 feet), with highest densities below 50 m (164 feet). Another study shows that ichthyoplankton of rockfish species are generally found above the pycnocline,[3] but are highly variable. Generally, rockfish larvae typically occurred in the upper 80 m (262 feet), highest densities were in the 40-80 m (131-262 feet) stratum offshore, with extremely low densities in the upper 30 m (98 feet). Additionally, certain species exhibit vertical migration patterns where they move between depths at various points during the day (daylight hours, evening hours, or at dawn and dusk) in response to daylight or predator/prey presence. The ichthyoplankton analysis developed for Cabrillo Port was developed based on the best available data within the proposed Project area; however, the data do not provide adequate detail for developing an analysis or providing recommendations on alternative depth locations for the seawater intake valves that would reduce potential impacts.

[3] A pycnocline is a layer of rapid change in water density with depth. In oceans this is mainly caused by changes in water temperature and salinity.

The daily density values determined for the Cabrillo Port Project represent impacts on fishery populations that can be considered adverse but less than their significance criteria when considered relative to the area potentially impacted by Project activities requiring seawater uptake. Considering the species, densities, and percentages affected by the proposed Project, entrainment impacts on any special status species (listed, candidate, sensitive, or managed species with EFH in the Project area) would be adverse but less than the significance level. The known density and species occurrence near the Project site, the amount of seawater that would be taken in the FSRU and LNG carriers during operations, the depth and location of the ballast water pumps, and the flow rates at the uptake valves, indicate that a significant impact on ichthyoplankton or managed species with EFH in the Project area from impingement or entrainment would not occur.

**Cooling Water Discharges.** Generally, thermal discharges can potentially impact biological communities in the receiving water source. Increases in water temperature can reduce dissolved oxygen levels. This may result in the suffocation of some species while encouraging the overgrowth of others. A range of biological functions may also be affected, including critical growth periods, reproduction, site avoidance, and migratory blockage. Additionally, the survival, motility, and vitality of species can be affected.

Changes made to the seawater intake and discharge systems by the Applicant since publication of the March 2006 Revised Draft EIR have resulted in a reduction of seawater usage and thermal impact. The cooling water would be discharged from the FSRU at a temperature of 20°F (11°C) warmer than the ambient seawater temperature at the point of discharge. This would result in a warm water plume being discharged at the aft end of the FSRU that would be quickly dissipated due to the location offshore within the Southern California Bight and the prevailing currents near the FSRU. Discharge plume dispersion modeling was developed for three different scenarios: 800 million standard cubic feet per day (MMscfd), 1,200 MMscfd, and inert gas generator (IGG) systems operation. The three scenarios were modeled under both maximum and mean current speeds. The plume dispersion study for normal operation (800 MMscfd) has shown that at this discharge temperature, the water would cool to 2.63°F (1.46°C) above the ambient conditions within 165 feet (50 m) of the FSRU with typical current velocities of 0.25 knots (WorleyParsons 2006b). For operation with 1,200 MMscfd throughput and during IGG operation, the water would cool to 2.75°F (1.53°C) above the ambient conditions within 165 feet (50 m) of the FSRU with typical current velocities of 0.25 knots. The area of open ocean that would be receiving the thermal discharge from the cooling water systems on board the FSRU does not contain any sensitive biological communities such as kelp beds, or hard bottom habitats; however, existing plankton communities could be adversely affected by the proposed discharge.

The State Water Resources Control Board (SWRCB) adopted the Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Waters and Enclosed Bays and Estuaries of California (Thermal Plan) in 1975 (SWRCB 1975). The Thermal Plan lists waterbodies to which specific criteria apply, i.e., coastal and interstate waters and enclosed bays and estuaries. The Thermal Plan does not list open ocean waters; however, the Thermal Plan does suggest criteria for evaluating impacts from thermal discharges that may be applied to open ocean waters. Specific numeric and narrative water quality objectives for new discharges of heat are outlined and for discharges in coastal waters, the Thermal Plan states:

- Elevated temperature wastes shall be discharged to the open ocean away from the shoreline to achieve dispersion through the vertical water column;
- Elevated temperature wastes shall be discharged a sufficient distance from areas of special biological significance to assure the maintenance of natural temperature in these areas;
- The maximum temperature of thermal waste discharge shall not exceed the natural temperature of receiving water by more than 20°F ; and
- The discharge of elevated temperature wastes shall not result in increases in the natural water temperature exceeding 4°F at (a) the shoreline, (b) the surface of any ocean substrate or (c) the ocean surface beyond 1,000 feet from the discharge.

The proposed Project would be consistent with the requirements of the plan with the exception of slightly elevated initial discharge temperatures. Based on the low ichthyoplankton densities identified in the ichthyoplankton analysis and the discharge plume dispersion modeling results showing quick dispersion, it is not anticipated that any significant changes in ambient water temperature would persist or cause impacts on sensitive biological communities within the thermal discharge plume. See Section 4.18, "Water Quality," for further analysis of ambient water quality and temperature regulations.

**Biomass Discharge.** Once ballast water and other seawater sources are discharged back into the ocean, it would contain certain amount of biomass from any marine organisms that suffered mortality during the uptake or while in the various seawater systems. The density of these organisms at the Project site is relatively low and many of these organisms are subject to high rates of natural mortality. Potential impacts from increased biomass being discharged and accumulated in the water column include the potential decrease in natural light entering the surface waters, potential degradation of benthic communities, accumulation of biomass to toxic levels, and aesthetically undesirable discoloration of surface waters. Although this is not a well-studied impact, due to the expected low densities of entrained ichthyoplankton, the reintroduction of the biomass to the surrounding waters of the open ocean environment would not increase the amount of organic material in the water column sufficiently to cause any of the above results. Additionally, given the depth of the water and the current circulation patterns and velocities in the immediate area of the discharge, any potential accumulation of biomass would be quickly dispersed horizontally as well as through the vertical water column, and impacts would remain below the significance criteria.

Indirect impacts on fisheries resources and EFH could occur by entrainment in seawater intake volumes. Changes in marine biodiversity affect the food web by causing cascading effects up and down the food chain. The following is a qualitative analysis used to describe minor impacts of seawater intake on a hypothetical marine fish food chain. This analysis assumes the following: (1) “nonfish zooplankton” populations are composed primarily of copepods, (2) the average weight of an individual copepod is 0.56 microgram (µg) (2.0 x $10^{6}$ ounces) (Hicks 1985), and (3) the efficiency of energy transfer between trophic levels, i.e., levels on a food chain, is 10 percent, i.e., consumers gain approximately 10 percent of the weight of the prey consumed, described in more detail below.

Using an estimate of 3.79 million nonfish zooplankton, i.e., mostly copepods, per 1 million gallons of seawater (USCG and MARAD 2006a), it is estimated that approximately 85,490 zooplankton per day, or 31.2 million zooplankton per year, would be entrained by the FSRU under average annual conditions. A range of 40,807 to 149,212 zooplankton per day (14.9 million to 54.5 million zooplankton per year) was estimated based upon minimum and maximum seawater intake scenarios. Assuming an average weight of 0.56 µg per copepod, the Project would affect the food web by removing approximately 0.05 gram (0.0001 lbs) of copepod biomass per day or 17.47 grams (0.04 lbs) of copepod biomass per year on average. A range of 0.02 to 0.08 grams (0.00004 to 0.0002 lbs) per day or 8.34 to 30.52 grams (0.018 to 0.067 lbs) per year was estimated based upon minimum and maximum seawater intake scenarios.

Laboratory and field studies of marine organisms indicate that the average efficiency of energy transfer from one trophic level on the food web to the next trophic level is about 10 percent. In other words, only 10 percent of the energy available at one trophic level is passed on to the next (Sumich 1988). Therefore, an average loss of 17.47 grams (0.04 lbs) of copepod biomass per year would result in the annual loss of approximately 1.75 grams (0.004 lbs) of small planktivorous fish biomass and approximately 0.18 grams (0.0004 lbs) of large piscivorous fish biomass. This represents a negligible loss compared to the total amount of biomass available in the Southern California Bight. Moreover, this biomass would not be completely lost to the marine food web. Dead biomass discharged from the FSRU would still be available to detritovores.

To minimize disturbance of marine biota behavior or sensitive habitats due to lighting or noise, the Applicant has incorporated the following measures into the proposed Project:

**AM BioMar-3a.** **Construction/Operations Lighting Control.** A plan would be developed in consultation with a marine bird expert and submitted for approval by the USCG and the CSLC at least 60 days prior to construction. The plan would include the following lighting restrictions:

- Limit lighting used during construction and operation activities to the number of lights and wattage necessary to perform such activities;
- Extinguish all lights used for that activity, once an activity has been completed;

- Shield lights so that the beam falls only on the workspace and so that no light beams are *directly* visible more than 3,281 feet (1000 m) distant; and
- Limit lights shining into the water to the area immediately around the vessels, except that searchlights may be used when essential for safe navigation, personnel safety, or for other safety reasons.

Lights required by the USCG or for safety purposes would be used in accordance with Federal regulations and would not be subject to the restrictions listed above.

**AM NOI-4a.** **Construction Noise Reduction Measures** would apply to this impact (see Section 4.14, “Noise and Vibration”).

<u>Mitigation Measures for Impact BioMar-3: Temporary or Permanent Alteration or Disturbance of Marine Biota Behavior or Sensitive Habitats</u>

**MM BioMar-3b.** **Monitoring.** If intertidal beach work occurs between February and September, the Applicant shall ensure that a qualified biologist will monitor the beach within 100 feet (30.5 m) of the route during the two weeks prior to installation. If a grunion spawning event occurs during the two weeks prior to construction activities, installation will be delayed until the grunion eggs have hatched (approximately two weeks). A qualified biologist shall determine the day in which construction can begin again after the spawning event.

**MM BioMar-3c.** **Avoidance.** Although recent surveys of the Project site have not identified any hard bottom areas, the Applicant shall ensure that any unexpected hard bottom habitats encountered during construction will be avoided.

**MM NOI-1a.** **Efficient Equipment Usage** would apply to this impact (see Section 4.14, “Noise and Vibration”).

Implementation of these measures would reduce impacts to a level that is below the relevant significance criteria by avoiding critical spawning habitat for special status species (grunion) and avoiding sensitive habitats (hard bottom areas) that many sensitive species rely on for survival. Implementation of these mitigation measures would also reduce any significant impacts on marine biota from lighting or noise from construction and operational activities that could cause changes in behavior. Such shielded lighting has resulted in significant reductions in bird mortality on other projects. By using muffling and shielding devices and by using lighting sparingly and in limited areas and intensities, these measures would reduce noise and lighting impacts in the Project site and surrounding area to a level below the relevant significance criteria.

**Impact BioMar-4: Construction or Operation Vessels Act as an Attractive Nuisance or Disrupt Marine Mammal Behavior or Migrations**

***Construction or operational activities could alter sensitive habitats such that marine mammal reproduction could be reduced, prey species could be eliminated, or animals might avoid an area (CEQA Class III; NEPA moderate or major adverse, short- or long-term).***

Most marine mammals are extremely wide-ranging. The breeding grounds for species of marine mammals do not include areas within the proposed Project site, with the possible exception of some species of oceanic dolphins, e.g., the long-beaked common dolphin, which breed throughout their range, and Dall's porpoise. Oceanic dolphins and Dall's porpoises are distributed across vast stretches of the eastern North Pacific and any interruption of breeding activities would have no measurable impact on populations. Moreover, oceanic dolphins are frequently observed breeding in the presence of boats, so it is not likely that Project activities would have any impacts on breeding activities. Most prey of marine mammals are similarly wide-ranging, with the most productive feeding grounds a considerable distance from the Project site (see Section 4.7.1, "Environmental Setting").

Avoidance of the immediate area surrounding the Project site by some species is a possibility, particularly during the construction phase, but such reactions would be localized and short-term. Most common species of marine mammals, along with several threatened and endangered species, have been observed from production oil platforms in the area, and it is very unlikely that operation of the FSRU would result in the avoidance of the area by marine mammals. Impacts could therefore be adverse, but would not rise above significance criteria, and no mitigation measures would be required.

**Impact BioMar-5: Noise Disrupting Marine Mammal Behavior**

***Noise from construction and operation vessels or equipment could disrupt migrations; interfere with or mask communications, prey and predator detection, and/or navigation; cause adverse behavioral changes; or result in temporary or permanent hearing loss (CEQA Class I; NEPA major adverse, long-term).***

According to Carretta et al. (2002), increasing levels of manmade noise in the world's oceans has been suggested to be a habitat concern for whales and particularly for baleen whales that may communicate using low-frequency sound. Such sounds may not only affect communications but also may cause whales to divert from normal migration paths or to stop feeding or reproductive activities. Such sounds may also reduce the abilities of marine mammals to detect prey or predators and, in the case of *odontocetes* (toothed whales, dolphins, and porpoises) the ability to navigate.

The nearby waters of the CINMS are heavily ensonified by anthropogenic noise (noise caused by humans). The natural background noise levels in the undisturbed ocean at the Project site vary from around 90 dB reference (re) 1 µPa – rms to 110 dB re

1 μPa - rms, depending on ambient weather conditions (see "Noise Measurements" in the following discussion for an explanation of noise levels).(Entrix 2004 [see Appendix H2]). This natural undisturbed background noise level will be raised by other marine activities, such as shipping movements in the nearby shipping channel, so that at the FSRU location the lower level of background noise would generally be closer to 110 dB re 1 μPa – rms.

The long-established, well-traveled Coastwise Vessel Traffic Lane passes parallel to an area in the CINMS known for the world's largest stock of blue whales, increasing numbers of gray and humpback whales, and numerous other marine mammal species. Species accounts note these animals occur in the region, including the north shores of the four northern Channel Islands and the Santa Rosa-Cortes Ridge. Only parts of the CINMS are attractive to such species, either as migration corridors or as feeding grounds. CINMS encompasses 1,272 $mi^2$ (3,294 $km^2$), and the Project site is outside of CINMS. Moreover, extensive NOAA Fisheries surveys over many years have failed to turn up any such species in the Project area (Carretta et al. 2005). Near Anacapa Island, the traffic lane passes through CINMS waters. In addition, smaller vessels from northern ports and from Santa Barbara Harbor, Ventura Harbor, Channel Islands Harbor, and Port Hueneme routinely travel within the CINMS.

The greatest concentrations of marine mammals in the region lie off the north shores of the Santa Barbara Channel, immediately south of the traffic lane and platforms. Other concentrations sometimes occur to the southeast of San Miguel and Santa Rosa Islands, toward San Nicolas Island. By contrast, comparatively few marine mammal sightings have been reported at or near the proposed Project site, probably because it is not in an area characterized by vigorous upwelling and food production known to attract marine mammals.

Exposure to very loud sounds or continued exposure to loud noise can result in a temporary (hearing) threshold shift or a permanent (hearing) threshold shift in which part or all of an animal's hearing is reduced or eliminated throughout part or all of its hearing range, either temporarily or permanently. With extremely powerful impulse noises such as those generated by explosives, geophysical exploration using airguns, certain sonar equipment, pile driving, and other impulse power sources, physical trauma or mortalities are possible (Richardson et al. 1995). No impulse power sources would be generated by the proposed Project activities. A catastrophic failure of one or more LNG tanks could result in a massive release of LNG to the ocean, resulting in some noise. Ignition of such a release could result in a substantial vapor cloud (flash) fire, also generating considerable, but short-lived noise.

The collective knowledge of the hearing frequency ranges of various species is extremely limited, however. In many cases it is based on recordings made of an animal's vocalizations, which likely do not represent the full range of hearing for each species. Thus, one of the few assumptions that might be made is that animals can be harassed by loud noises within the frequency range of their vocalizations. Assumptions cannot be made that an animal would not be disturbed by loud noises beyond its range of vocalization; it may still be able to hear such sounds even though it cannot produce them. Moreover, extremely powerful sounds, such as those generated by explosives, can still injure or kill an animal even if the predominant frequencies are beyond the animal's hearing frequency range.

Frequencies are measured in hertz (Hz). One Hz equals one cycle per second, while one kHz represents 1,000 Hz. Humans with excellent hearing can detect sounds as low as 20 Hz or as high as 20 kHz. Some marine mammals can detect sounds as low as 12 Hz (perhaps even as low as 5 Hz), while others may detect sounds as high as 180 kHz or more (Richardson et al. 1995). Sound frequencies are of concern because the ears and other parts of a marine mammal may be particularly sensitive to certain frequencies or resonances applied over a period of time. Low-frequency sounds (under 1000 Hz) are of special interest because they can propagate long distances and are peak frequencies for many anthropogenic sound sources. Conversely, high-frequency sounds attenuate with distance. (The sound sources for this Project were calculated from 22 Hz to 11.3 kHz.) The longer that substantial pressure from a given frequency range is applied to an animal, the greater the potential for harassment or damage. Understanding the hearing frequency ranges of various marine mammal species is particularly useful in assessing potential harassment impacts, particularly when sound levels within these frequencies can be calculated.

The known hearing frequency ranges of most species that occur in the Southern California Bight are summarized in Table 4.7-10. California sea lions and Pacific harbor seals hear at frequencies ranging as low as 100 Hz to as high as 60 and 180 kHz, respectively.

**Table 4.7-10 Frequency Hearing Ranges for Selected Marine Mammal Species**

| Taxa | Common Name | Genus/Species | Frequency Range |
|---|---|---|---|
| Odontocetes | Short-beaked common dolphin | *Delphinus delphis* | 500 Hz to 67 kHz |
| | Short-finned pilot whale | *Globicephala macrorhynchus* | 500 Hz to 20 kHz |
| | Risso's dolphin | *Grampus griseus* | 80 Hz to 100 kHz |
| | Pacific white-sided dolphin | *Lagenoryhnchus obliquidens* | 2 kHz to 80 kHz |
| | Northern right whale dolphin | *Lissodelphis borealis* | 1 kHz to 40 kHz |
| | Killer whale | *Orcinus orca* | 500 Hz to 120 kHz |
| | False killer whale | *Pseudorca crassidens* | 1.1 kHz to 130 kHz |
| | Spotted dolphin | *Stenella attenuata* | 3.1 kHz to 21.4 kHz |
| | Striped dolphin | *Stenella coeruleoalba* | 6 kHz to 24 kHz |
| | Spinner dolphin | *Stenella longirostris* | 1 kHz to 65 kHz |
| | Bottlenose dolphin | *Tursiops truncates* | 40 Hz to 150 kHz |
| | Hubbs' beaked whale | *Mesoplodon carlhubbsi* | 300 Hz to 80 kHz |
| | Blainville's beaked whale | *Mesoplodon densirostris* | 1 kHz to 6 kHz |
| | Pygmy sperm whale | *Kogia breviceps* | 60 kHz to 200 kHz |
| | Sperm Whale | *Physeter macrocephalus* | 100 Hz to 30 kHz |
| | Harbor porpoise | *Phocoena phocoena* | 1 kHz to 150 kHz |
| | Dall's porpoise | *Phocoenoides dalli* | 40 Hz to 149 kHz |

**Table 4.7-10 Frequency Hearing Ranges for Selected Marine Mammal Species**

| Taxa | Common Name | Genus/Species | Frequency Range |
|---|---|---|---|
| Mysticetes | Gray whale | *Eschrichtius robustus* | 20 Hz to 2 kHz |
| | Minke whale | *Balaenoptera acutorostrata* | 60 Hz to 20 kHz |
| | Sei whale | *Balaenoptera borealis* | 1.5 kHz to 3.5 kHz |
| | Bryde's whale | *Balaenoptera edeni* | 70 Hz to 950 Hz |
| | Blue whale | *Balaenoptera musculus* | 12 Hz to 31 kHz |
| | Fin whale | *Balaenoptera physalus* | 14 Hz to 28 kHz |
| | Humpback whale | *Megaptera novaeangliae* | 20 Hz to 10 kHz |
| Pinnipeds | Northern fur seal | *Callorhinus ursinus* | 4 kHz to 28 kHz |
| | California sea lion | *Zalophus californianus* | 100 Hz to 60 kHz |
| | Northern elephant seal | *Mirounga angustirostris* | 200 Hz to 2.5 kHz |
| | Pacific harbor seal | *Phoca vitulina richardsi* | 100 Hz to 180 kHz |
| Mustelids | Southern sea otter | *Enhydra lutris nereis* | 3 kHz to 5 kHz |

*Sources:* Au et al. 2000; Lenhardt 1994; Moein et al. 1994; Richardson et al. 1995; Ridgway et al. 1997.
*Note:* Most of the frequency ranges listed above represent the range of frequencies in which these species vocalize. In a few cases, frequency response ranges are known and are presented. In all cases, the most extreme ranges known at low and high frequencies are noted.

*Continuous Noise*

A potential exists for adverse behavioral impacts on marine mammals as a result of noise from construction and operation vessels or equipment associated with the Port. Presently there is limited published information considering the effects of anthropogenic noise on marine mammal behavior, and most studies have been observational rather than experimental in nature. In most instances, particularly with regards to the effects of noise from large vessels on marine mammal behavior, the available data has lacked appropriate controls. In findings from NOAA's 2004 symposium directed at shipping noise and marine mammals, it was determined that much of the recent data on the effects of vessel activities on marine animals involve craft considerably smaller than tankers, container and dry bulk ships, and cruise liners (NOAA 2004). It was determined that some of these observations are presumably relevant to commercial shipping noise as well, though this remains largely an unanswered question.

Data indicate that various dolphin and whale species exposed to close physical approaches as well as noise from different vessels may alter motor behaviors (Janik and Thompson 1996; Nowacek et al. 2001; Williams et al. 2002; Hastie et al. 2003) as well as vocalization characteristics (Lesage et al. 1999; Au and Green 2000; Van Parijs and Corkeron 2001; Buckstaff, 2004; Foote et al. 2004). These changes in behavior have direct energetic costs and potential effects on foraging, navigation, and reproductive activities (NOAA 2004).

In recent years, studies have been conducted involving controlled sound exposure of animals fitted with specialized tags for monitoring movements, received sound fields, and, increasingly, physiological parameters. Nowacek et al. (2004a) used such techniques and showed that manatees respond to approaching vessels by changing fluke rate, heading, and dive depth. One of the most important experiments to date concerning the effects of shipping noise on marine mammal behavior involved the use of acoustic tags and controlled exposure experiments with north Atlantic right whales. Five of six individual whales responded strongly (interrupted dive pattern and swam rapidly to the surface) to the presence of an artificial alarm stimulus (series of constant frequency and frequency modulated tones and sweeps), but ignored playbacks of vessel noise (Nowacek et al. 2004b).

*Loud or Impulse Noise*

Tissue damage is possible as a result of shock waves from high level sounds, particularly at interfaces between tissues of different density (Turnpenny and Nedwell, 1994). Marine mammals have air spaces in their lungs, sinuses, and ears and gas in their gastrointestinal tracts. Shock waves can cause rapid compression and subsequent expansion of gas in these spaces, resulting in tissue damage (Richardson et al. 1995). Marine mammals in close proximity to large explosions are likely to suffer fatal injuries to tissues and organs. In some areas this may be common enough to have significant long-term effects on populations (Baird et al. 1994). Although it has previously been accepted that animals would move away from an area before sound levels became uncomfortably high, the fact that no overt behavioral reactions to industrial noise were observed in an area where two whales were killed by explosions suggests that this may not always be the case (Lien et al. 1993).

It is difficult to substantiate that the noise-induced mortalities that have been recorded are not isolated cases because dead cetaceans are rarely examined to establish a cause of death. A decline in the number of Irrawaddy dolphins (*Orcaella brevirostris*) in Lao PDR and northeastern Cambodia has been linked to incidental mortalities from explosives used by fishermen (Baird et al. 1994). Crum and Mao (1996) found that close proximity of marine mammals or humans to low frequency noise at sound levels in excess of 210dB re1 µPa at 500 Hz could result in significant growth of existing bubbles in capillaries and other small blood vessels. Although noise of this intensity is rare, they suggested that considerably lower intensity noises could induce bubble growth if the body fluid was already supersaturated with gas. This occurs when human divers using breathing apparatus are near decompression limits. Some cetaceans make repeated dives to great depth which may produce overpressure of nitrogen in muscle tissues (Ridgway and Howard, 1982); therefore, it is theoretically possible for intense sounds to induce the pathological conditions associated with bubble growth ("the bends") in cetaceans (Ridgway 1997). Recent studies of dead stranded cetaceans suggest that extensive exposure to mid-frequency sonar impulses used in Navy fleet exercises may have induced this phenomenon in deep-diving cetaceans (Howorth 2006); however, the analysis does not indicate that loud impulse sounds of this type would be generated by the proposed Project.

*Zones of Noise Influence*

Richardson et al. (1995) put forth the concept of delineating zones of noise influence to assess how anthropogenic noise might affect marine mammals. The zones not only show the attenuation of sound intensity (dB) with distance from the source, but also show potential species reaction. The zones include audibility, responsiveness, masking, and hearing loss and tissue damage. More recently, the U.S. Navy (2002) has used three zones of acoustic influence (audibility, responsiveness, and physical damage), since the range at which masking may begin occur is very difficult to determine. Much more research would be required to determine the zones of acoustic influence for each mammal species, but these zones have been estimated for the Project based on the most conservative NMFS criteria. Tables 4.7-11a and 4.7-11b summarize underwater construction noise levels. Table 4.7-12 identifies noise threshold levels with corresponding applications of each measurement. Table 4.7-13 summarizes underwater noise levels during Project operations.

**Table 4.7-11a Underwater Construction Noise from Offshore Marine Spread for the Pipelines**

| Equipment Type | Location | Average Load (%) | dB re 1 μPa – rms at 1 m | dB re 1 μPa – rms at 100 m | dB re 1 μPa – rms at 10 km |
|---|---|---|---|---|---|
| Small drilling rig | Offshore (nearshore) | 40 | 170 | 150 | 110 |
| Exit hole barge tug | Offshore (exit hole) | 20 | 164 | 144 | 104 |
| Supply boat | Offshore (various) | 20 | 174 | 154 | 114 |
| Lorelay pipe ship | Offshore (pipeline route) | 100 | 172 | 152 | 112 |
| Supply boat (larger) | Offshore (various) | 35 | 176 | 156 | 116 |
| Large crane (100 ton) | Offshore (pipeline route) | 50 | 153 | 133 | 93 |
| Small crane (35 ton) | Offshore (pipeline route) | 50 | 153 | 133 | 93 |
| Tugboats | Offshore (pipeline route) | 20 | 167 | 147 | 107 |
| Survey vessel | Offshore (pipeline route) | 35 | 154 | 134 | 94 |
| Helicopter | Offshore (pipeline route) | 100 | 162 | 142 | 102 |
| **Worst Case Results** | | | **180** | **160** | **120** |

*Source:* Entrix 2004 (see Appendix H2).
*Note* : dB=decibel.

**Table 4.7-11b Underwater Construction Noise from Offshore Marine Spread for the FSRU, Mooring and Riser Systems.**

| Equipment Type | Location | Average Load (%) | dB re 1 µPa – rms at 1 m | dB re 1 µPa – rms at 100 m | dB re 1 µPa – rms at 10 km |
|---|---|---|---|---|---|
| Anchor handling tug supply vessels (2) | Offshore (FSRU site) | 35 | 179 | 159 | 119 |
| Work boat | Offshore (FSRU site) | 35 | 154 | 134 | 94 |
| Tugboats (2) | Offshore (FSRU site) | 20 | 167 | 147 | 107 |
| Survey vessel | Offshore (FSRU site) | 35 | 154 | 134 | 94 |
| Helicopter | Offshore (FSRU site) | 100 | 162 | 142 | 102 |
| **Worst case results – rms** | | | **180** | **160** | **120** |

*Source:* Entrix 2004 (see Appendix H2).
*Note*: dB=decibel.

**Table 4.7-12 Noise Threshold Levels**

| Threshold Level | Representing | Application(s) | Organisms |
|---|---|---|---|
| 180 dB re 1 µPa | Peak pressure | Explosives | Marine mammals and sea turtles |
| 182 dB re 1 µPa² - s | Energy | Explosives | Marine mammals |
| 12 psi – ms | Impulse | Explosives | Marine mammals |
| 30 psi – ms | Impulse | Explosives | Birds on surface |
| 160 dB re 1 µPa – rms | Average peak pressure | Geophysical airguns | Baleen and sperm whales only |
| 180 dB re 1 µPa – rms | Average peak pressure | Geophysical airguns | Pinnipeds and small cetaceans |

*Take Thresholds*

Over the years, the NMFS has been using take thresholds — the sound exposure level at which harassment or injury may occur — to determine when marine activity that produces sound might result in a “take” of marine mammals. Currently, NMFS is developing new science-based thresholds with guidelines based on exposure characteristics that are derived from empirical data and are tailored to specific species groups and sound types to improve and replace the current criteria (Federal Register 2005). NMFS is in the process of preparing the required NEPA document that will address the proposed changes and any alternatives. The final decision documents have not been published as of the publication date of this Final EIS/EIR. Until a final decision is made, NMFS requires that the current acoustic criteria be used for impacts analysis.

**Table 4.7-13 Total Broadband Noise Generated under Different Operation Scenarios with Attenuation at 1 m from Source and Distance to Take Thresholds and Background Level**

| Operation Scenario | Expected Duration of Operation Scenario | Broadband (22 Hz to 11300 Hz) total (rms) at 1 m from source (dB re 1 μPa) | Potential Level A take = 190 dB re 1 μPa – rms | Potential Area Affected at Level A (190 dB) Take Threshold, Centered Around FSRU | Potential Level A take = 180 dB re 1 μPa – rms | Potential Area Affected at Level A (180 dB) Take Threshold, Centered Around FSRU | Potential Level B take = 120 dB re 1 μPa – rms (continuous) | Potential Area Affected at Level B Take Threshold, Centered Around FSRU | Distance at which Total Radiated Noise Levels Would Equal Background Noise Level (Approx. 90 dB)[a] |
|---|---|---|---|---|---|---|---|---|---|
| **Case 1**: 800 MMscfd, FSRU plus standard operating equipment | Approximately 90 percent of the time | 181.6 | NA | NA | 3.9 feet (1.2 m) | 47.8 square feet (4.5 $m^2$) | 0.9 miles (1.4 km) | 2.4 $mi^2$ (6.2 $km^2$) | 24.9 miles (40 km) |
| **Case 2**: 1.5 Bscfd, FSRU plus standard operation equipment for maximum throughput | Not a continuous operating scenario, but would allow surges in gas demand to be accommodated | 182.5 | NA | NA | 4.3 feet (1.3 m) | 57.0 square feet (5.3 $m^2$) | 1.0 miles (1.6 km) | 3.1 $mi^2$ (8.0 $km^2$) | 24.9 miles (40 km) |
| **Case 3**: Same as Case 1 but with main noise-contributing equipment mounted on vibration isolators | Expected approx. 90 percent of the time | 178.2 | NA | NA | NA | NA | 0.4 miles (0.6 km) | 0.4 $mi^2$ (1.1 $km^2$) | 16.2 miles (26 km) |
| **Case 4**: Same as Case 1 but LNG carrier alongside for day loading, no tugs | Approximately 10 percent of FSRU operating conditions | 182 | NA | NA | 4.3 feet (1.3 m) | 57.0 square feet (5.3 $m^2$) | 1.0 miles (1.6 km) | 3.1 $mi^2$ (8.0 $km^2$) | 24.9 miles (40 km) |

**Table 4.7-13 Total Broadband Noise Generated under Different Operation Scenarios with Attenuation at 1 m from Source and Distance to Take Thresholds and Background Level**

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Case 5**: Same as Case 4, but with tugs and maneuvering either side of loading sequence | Approximately 11.5 hours per week, or 6.8 percent of FSRU operating conditions. | 192.6 | 4.6 feet (1.4 m) | 66.7 square feet (6.2 $m^2$) | 14.1 feet (4.3 m) | 625.0 square feet (58.1 $m^2$) | 11.1 miles (17.9 km) | 389.0 $mi^2$ (1006.6 $km^2$) | 80.8 miles (130 km) |
| **Case 6**: FSRU running at 1.5 Bscfd with tugs and maneuvering | Approximately 11.5 hours per week or 6.8 percent of FSRU operating conditions | 192.6 | 4.6 feet (1.4 m) | 66.7 square feet (6.2 $m^2$) | 14.1 feet (4.3 m) | 625.0 square feet (58.1 $m^2$) | 11.1 miles (17.9 km) | 389.0 $mi^2$ (1006.6 $km^2$) | 80.8 miles (130 km) |
| **Case 7**: FSRU running at 1.5 Bscfd with IGG operating | Highly unlikely to occur because FSRU not expected to reach peak throughput during IGG operation. | 184.7 | NA | NA | 5.6 feet (1.7 m) | 98.0 square feet (9.1 $m^2$) | 1.1 miles (1.7 km) | 3.5 $mi^2$ (9.1 $km^2$) | 33.6 miles (54 km) |

*Source:* CJ Engineering 2006 (Appendix H3).

*Notes:*

MMscfd = million standard cubic feet per day; Bscfd = billion standard cubic feet per day; IGG = inert gas generator

[a] Distances and areas were estimated by E & E based upon noise levels given in CJ Engineering 2006.

As provided in the significance criteria for marine mammals, acoustic impacts on marine mammals are considered significant if the Project causes injury or mortality or results in an action that could be considered a Level A take under the MMPA or causes a Level B take of a listed or candidate species or a Level B take of significant numbers of non-listed marine mammals. The NMFS acoustic criterion for Level A take is 180 dB re 1 μPa – rms and for Level B take is 120 dB re 1 μPa – rms (continuous). In addition, NMFS (2006) requested that a zone of noise influence be defined for the 190 dB re 1 μPa – rms noise level, which would only occur during certain operational scenarios.

*Construction*

Table 4.7-11b above provides a list of equipment that would be used during construction of the offshore pipeline and the levels of underwater noise generated for each. During pipeline construction, including the shore approaches, the underwater noise level and impacts would vary depending on the construction equipment required during each specific activity. Data on noise levels for the listed equipment allow the maximum noise that could occur on a particular day to be evaluated from the starting day of the construction of the pipelines in the nearshore and offshore areas. Helicopters would be used for certain periods of the day or certain days only. Construction vessels, including the exit hole barge tug and the survey vessel, would have maximum noise intensities (depending on the specific vessel used) between 159-171 dB re 1 μPa – rms. This additional noise factor was taken into account for the entire duration of construction.

Based on the limited duration of the construction activities and the occurrence of these activities outside of gray whale migration season, significant acoustic impacts from offshore pipeline construction are not anticipated.

Very loud vessel noises are usually transitory and relatively short-lived. Construction vessels, however, may remain on site for extended periods. Although the noise of such vessels is not always loud, it is persistent. Generators, compressors, deck machinery, and other sound sources contribute to the cacophony of sounds produced by such vessels. Average peak pressure generated from vessels described in a noise analysis of construction activities for the proposed Project range from 156 to 181 dB (Entrix, Inc. 2004). Although a dynamic-positioning pipelaying vessel used west of Santa Barbara, California, was heard underwater 13 NM (15 miles or 24 km) from a construction site, the intensity of the sound was greatly reduced at this distance. Hundreds of gray whales were observed during this project, but no adverse impacts were noted, including migration diversion or startle reactions, even when the whales passed through the construction area (Woodhouse and Howorth 1992). The source level of the Lorelay pipe ship would be 172 dB re 1 μPa – rms (Entrix 2004 [Appendix H2]).

For proposed offshore pipeline construction and the proposed installation of the FSRU and its mooring and riser systems, the zone of audibility is based upon the range at which Project sounds could be detected above the quietest background noise levels, in this case above approximately 90 dB re 1 μPa – rms (Entrix 2004; CJ Engineering 2006 [Appendices H2 and H3]). During pipeline construction, this would include a radius of up to approximately 17.0 NM (19.6 miles or 31.5 km). The actual zone of audibility could be much closer to construction activities during rough sea conditions, toward the coast, and with much vessel traffic in the shipping lane because these conditions would raise the background noise level. Sound levels that occur solely within the zone of audibility and not in other zones closer to the noise source would not be expected to result in adverse impacts on marine mammals.

The zone of responsiveness, in which avoidance behaviors could possibly occur with some species, is estimated based on estimated sound pressure levels of 120 dB re 1 µPa – rms. Aggressive approaches or sudden changes in course and speed can result in strong avoidance reactions (Howorth 2006). At this range, Level B takes under the MMPA could possibly occur. This zone would include a radius of up to approximately 0.5 NM (0.6 mile or 1 km) from construction activities. This would correspond to an area of up to approximately 3.1 $km^2$ centered around pipeline construction activities.

Although the zone of physical damage may differ substantially among marine mammal species, for the Project, the estimate is based on a continuous level of 180 dB re 1 µPa – rms, in accordance with the current NMFS criterion for Level A takes. This zone would include a radius of up to approximately 3.3 feet (1 m) from pipeline construction activities. This would correspond to an area of up to 33.4 square feet (3.1 $m^2$). At these ranges, Level A takes under the MMPA could possibly occur.

Noise levels beyond the 190 dB re 1 µPa – rms level would not occur during pipeline construction activities or during installation of the FSRU and its mooring and riser systems.

*Operation*

<u>Vessels, LNG Carriers, and Helicopters</u>

Operational vessels generate steady, continuous noises that vary somewhat in intensity, depending upon a given operation scenario. Noise produced by the LNG carriers would likely be loudest at cruising speeds and reduced in volume when moored and discharging LNG. During the transfer process, the LNG carrier would be moored to the FSRU and would only generate minimum noise; the LNG carriers would not be using propulsion systems while docked at the FSRU. The main noise associated with LNG carrier docking would be associated with tugs and the FSRU thrusters. The total level for the combination would be 192 dB re 1 µPa – rms broadband. Similarly, crew and supply vessels would be loudest when underway, but such sounds would be transitory and short-lived. Supply vessels would generate a maximum of 181 dB re 1 µPa – rms, reducing to 174 dB re 1 µPa – rms at 1 m from the source. Helicopters are loudest during approach and takeoff, when they must use maximum power and when they are closest to the water. At their minimum flying altitude, they would generate noise at 162 dB re 1 µPa – rms within 1 m of the helicopter. This noise level would continue only briefly while near the helipad, which in itself would reflect a considerable amount of noise, helping to attenuate the sound. Although the FSRU would be equipped with a helicopter landing pad, helicopters would not be used as part of the regular operations. Helicopters may be used as appropriate in the rare case of an emergency, such as a medical illness of one of the FSRU crew members, or for occasional visitors.

Reactions exhibited by marine mammals to underwater noise from vessels (and platforms) vary widely. In general, pinnipeds and small cetaceans seem little affected by transitory or continuous noise and may become habituated to it. For example, California sea lions regularly haul out on mooring buoys and lower decks of oil platforms, and several species of dolphins regularly bow-ride vessels moving through the water. Baleen whales generally ignore stationary or distant sounds. If a vessel approaches slowly, with no aggressive moves, whales may shy away from such vessels in subtle ways (Howorth 2006).

Pipeline

Operation of the pipeline from the FSRU to shore may generate noise caused by the friction from the natural gas flowing through the risers, pipeline, and through various valves and fittings. A study was developed to estimate the underwater-radiated noise from the pipeline using 10 different flow cases. The analysis found that the total level of underwater radiated noise under normal operating conditions (800 MMscfd) was 96 dB, which is 6 dB higher than background noise on a calm day. The potential noise generated from the pipeline when the FSRU is operating at maximum capacity (1,200 MMscfd) was 106 dB, 16 dB above background on a calm day and less than background on a windy day (WorleyParsons 2005).

FSRU

The FSRU would generate less noise when it is stationary than when the thrusters are in use. The FSRU would generate the most noise when its thrusters are being used and tugs are nudging the LNG carrier into position. Noise levels and distances from the FSRU of take thresholds for marine mammals were estimated for seven operating scenarios, as shown in Table 4.7-13 above. Level A (180 dB re 1 µPa – rms) and Level B (120 dB re 1 µPa – rms, continuous) were used. Level B 160 dB re 1 µPa – rms (impulse) was not used, as the noise generated by the FSRU would be continuous rather than impulsive in nature. NMFS (2006) also requested zones of influence for noise levels at 190 dB re 1 µPa – rms. These estimates were made using engine manufacturers' noise specifications and factor in the structural elements of the FSRU design (CJ Engineering 2006).

Total broadband frequencies from the FSRU range from 22 Hz to 11.3 kHz. The low frequency sound produced by the FSRU above 99 Hz would probably not be heard by pinnipeds (whose hearing ranges from 22 Hz to 99 Hz) but would be heard by other marine mammals whose hearing frequency ranges from 99 Hz and higher (see Table 4.7-10 above). Frequencies over 11.3 kHz would not be produced by the FSRU. The higher the frequency of sound, the greater the attenuation (reduction) is over distance.

For the four operation scenarios that would occur most of the time (Cases 1 to 4 as shown on Table 4.7-13 above), the originating broadband level of 178.2 to 182.5 dB would fall to ambient noise levels (90 dB re 1 μPa – rms) at a maximum of approximately 21.6 NM (24.9 miles or 40 km) from the FSRU (CJ Engineering Consultants 2006). For three less common or unlikely operating scenarios (Cases 5 to 7), the originating broadband level of 184.7 to 192.6 dB would fall to ambient noise levels (90 dB re 1 μPa – rms) at a maximum of approximately 70.2 NM (80.8 miles or 130 km) from the FSRU (CJ Engineering Consultants 2006). The increasingly shallow depths near the shores of the islands and mainland, in the Anacapa Passage, and along the Pilgrim Banks to the southeast of the Project site, would also help to attenuate sound from the Project (Howorth 2005).

The waterborne noise level from the FSRU would be above the known background level, but its relationship to background level would depend on ambient weather conditions and other marine activities. The zones of noise influence presented in the following text are the maximum distance from the noise source and associated areas centered around the noise source that would occur.

For the Project, the zone of audibility is based upon the range at which Project sounds could be detected above the quietest background noise levels, in this case above approximately 90 dB re 1 μPa – rms (Entrix 2004; CJ Engineering 2006 [Appendices H2 and H3]). During standard operations (Cases 1 to 4), this would include a radius of up to approximately 21.6 NM (24.9 miles or 40 km) from the FSRU for normal operational scenarios and up to 70.2 NM (80.8 miles or 130 km) from the FSRU for less likely or uncommon operational scenarios (Cases 5 to 7). This is a maximum projection; the actual zone of audibility could be much closer in to the FSRU during rough sea conditions and with much vessel traffic in the shipping lane. Sound levels that would occur solely within the zone of audibility and not in other zones closer to the noise source would not be expected to result in adverse impacts on marine mammals.

The zone of responsiveness, in which avoidance behaviors could possibly occur with some species, is estimated based on estimated sound pressure levels of 120 dB re 1 μPa – rms. At this range, Level B takes under the MMPA could possibly occur. This zone would include a radius of up to approximately 0.9 NM (1.0 miles or 1.6 km) from the FSRU for normal operational scenarios (Cases 1 to 4) and up to 9.7 NM (11.1 miles or 17.9 km) from the FSRU for less likely or uncommon operational scenarios (Cases 5 to 7). This would correspond to an area of up to 8.0 $km^2$ for normal operations and up to 1,006.6 $km^2$ for less common and unlikely operational scenarios.

Although the zone of physical damage may differ substantially among marine mammal species, for the project, the estimate is based on a continuous level of 180 dB re 1 μPa – rms, in accordance with the current NMFS criterion for Level A takes. This zone would include a radius of up to approximately 4.3 feet (1.3 m) from the FSRU for normal operational scenarios (Cases 1 to 4) and up to 14.1 feet (4.3 m) from the FSRU for less likely or uncommon operational scenarios (Cases 5 to 7). This would correspond to an area of up to 5.3 $m^2$ for normal operations and up to 58.1 $m^2$ for less common and unlikely operational scenarios. At these ranges, Level A takes under the MMPA could possibly occur.

For two operational scenarios that would be expected to occur approximately 11.5 hours per week (Cases 5 and 6), source noise levels would be 192.6 dB re 1 µPa – rms. This zone, defined by a threshold of 190 dB re 1 µPa – rms, would include a radius of up to approximately 4.6 feet (1.4 m) from the FSRU. This would correspond to an area of up to 6.2 $m^2$. At these ranges, Level A takes under the MMPA could possibly occur.

Between the outer limit of the zone of responsiveness and the outer limit of the zone of physical damage under normal and likely operational scenarios, frequencies between 22 Hz and approximately 2,828 Hz would dominate and frequencies higher than 2,828 Hz would be heard above background levels. Species whose hearing range is higher than 2,828 Hz (see Table 4.7-10 above) and thus would not be affected include spotted dolphin, striped dolphin, pygmy sperm whale, northern fur seal and southern sea otter. Other species, whose hearing range would be only marginally within the noise produced between these zones, i.e., hearing ranges above 1 kHz, include Pacific white-sided dolphin, northern right whale dolphin, false killer whale, Blainville's beaked whale, harbor porpoise, and sei whale. While noise produced between 120 and 180 db re 1 µPa – rms may be audible to these species, it would be unlikely to result in response behaviors. Species with hearing ranges in the low frequency ranges, i.e., below 500 Hz, would be most susceptible to noise impacts from the FSRU, including Risso's dolphin, bottlenose dolphin, Hubb's beaked whale, sperm whale, gray whale, minke whale, Bryde's whale, blue whale, fin whale, humpback whale, California sea lion and northern elephant seal.

The Applicant has incorporated the following into the proposed Project:

**AM BioMar-9a**. **Avoid Offshore Construction during Gray Whale Migration Season** would apply to this impact.

**AM BioMar-9b. Marine Mammal Monitoring** would apply to this impact.

Mitigation Measures for Impact BioMar-5: Noise Disruption of Marine Mammal Behavior

**MM BioMar-5a. Noise Reduction Design.** The Applicant shall work with marine architects, acoustic experts and mechanical engineers and the USCG, among others, to design the FSRU and its equipment to reduce, to the maximum extent feasible, the output of cumulative noise from the facility.

**MM BioMar-5b. Acoustic Monitoring Plan.** The Applicant shall prepare an acoustic monitoring plan to obtain site-specific baseline data and empirical data prior to and during LNG operations.

The tasks involved in the acoustic monitoring plan are described below. These tasks will be performed by independent, third-party monitors qualified for such tasks and approved in advance by the appropriate regulatory agencies, such as USFWS, NOAA (NMFS), and CDFG.

- Obtain pre-construction, site-specific data on the presence, species composition, abundance, frequency, and seasonality of marine mammals specific to the Project site (twice-monthly aerial line transect surveys for one to two years).
- Obtain seasonal conductivity (density/salinity), temperature, and depth measurements at the Project site before construction begins. Concurrently, measure levels of natural ambient sound at the sampled depths in a variety of sea states, provided that sea conditions are not so severe that they compromise the ability to obtain good data (sound pressure level recordings). Also, measure sounds of various vessels as they pass the Project site in the nearby shipping lane (sound pressure level recordings four times a year for one to two years).
- Take empirical measurements of operational sound at various depths, distances and directions from the Project site (sound pressure level recordings). Obtain seasonal conductivity (density/salinity), temperature, and depth measurements at all sampling stations. Take measurements during cold and warm water influxes. Measurements will be taken of the LNG carrier and tugs berthing and leaving FSRU; the LNG carrier attendant vessels; all operational modes of FSRU, support vessels, and helicopters during normal operations; and pipeline noise.
- Document behaviors of marine mammals exposed to operational noise (passive tracking and observations four times a year for one to two years). Concurrently, measure sound levels from Project operations received by the marine mammals (sound pressure level recordings).
- Evaluate acoustic monitoring results against NOAA Fisheries (NMFS)-accepted sound thresholds as results become available. In consultation with regulators, make recommendations as to whether noise levels can be reduced and whether continued or future monitoring is necessary.

**MM BioMar-5c. Helicopter Altitude.** The Applicant shall ensure that helicopters maintain a flight altitude of at least 2,500 feet (762 m), except during takeoff and landing**.**

**MM NOI-1a. Efficient Equipment Usage** would apply to this impact (see Section 4.14, “Noise and Vibration”).

Implementation of these mitigation measures would reduce the intensity and duration of anthropogenic noise introduced to the marine environment and would thus reduce impacts on marine mammals, but it is unclear whether impacts would be reduced to a level below significance criteria. Additionally, avoiding the marine mammal migration season would reduce the numbers of certain marine mammals exposed to noise in the Project site during the construction activities. No impulse sounds are anticipated during normal construction and operational activities.

**Impact BioMar-6: Mortality and Morbidity of Marine Biota from Spills**

***Although rare, an accidental release of a significant amount of oil or fuel during construction or operation, or LNG spills or a natural gas leak from subsea pipelines, could cause morbidity or mortality of marine biota, including fish, invertebrates, seabirds, and special status species such as sea turtles, through direct contact or ingestion of the material (CEQA Class I; NEPA major adverse, long-term).***

*Construction*

An accidental release of diesel, oil, or other toxic substances during construction activities could disturb foraging activities, migration patterns, and spawning events or cause direct harm to marine species and habitats. A release of fuel oils may effectively narcotize invertebrate species, making them more susceptible to predation. Due to their size and mobility, fish species are less likely to be affected by such a release. Any such release would float to the water's surface and disperse from the immediate spill area and would affect only a small number of individual organisms. Information obtained from other spills indicates that surface water currents will move any floating oil along at the same speed as the current. Wind-driven oils tend to move at a speed between zero and six percent of the wind speed.

The oil pollution contingency plan for the pipelaying vessel identified a worst case scenario, in which a vessel carrying 1,500 $m^3$ (396,258 gallons) of fuel loses 25 percent (375 m3 or 99,065 gallons) of its fuel. The trajectory analyses for the 72-hour spill scenario estimated four cases with variable currents and wind directions, in which there is no oil spill response (containment or skimming). The trajectory analyses show potential for oiling coastline on the mainland from approximately Isla Vista and Santa Barbara south to Point Fermin near Los Angeles Harbor. A case with a westerly current presents potential for oiling the shorelines of Anacapa and Santa Cruz Islands. A case with reinforcing wind and currents to the west also presents the potential for oiling the shorelines of Santa Rosa and San Miguel Islands. Due to the lack of southerly flowing offshore currents, there were no trajectories that could transport oil to Santa Catalina or Santa Barbara Islands. When oil spill response with available oil skimming capacity is considered, the extent of shoreline that could be oiled is significantly reduced (BHPB 2004b).

*Operation*

Diesel, Oil, or Toxic Substance Spill

The potential impacts of an accidental release of diesel, oil, and other toxic substances during operation would be the same as those during construction, discussed above. Oil spill trajectory modeling indicates that oils accidentally spilled in the Project site would travel a maximum distance depending on ambient current and wind conditions of between 21 to 67 NM (24 and 77 miles or 39 and 124 km) from the spill location (BHPB 2004). The Applicant has prepared a Vessel Oil Pollution Contingency Plan to establish procedures for handling a range of possible oil pollution emergencies during pipelaying operations and a Facility Oil Pollution Contingency Plan for oil, natural gas, and other hazardous material releases during operation of the FSRU, which describe prevention measures, resources at risk, and various modeling scenarios for potential fuel spills. Under the worst credible case scenario, in which the entire contents of the diesel fuel storage tank (264,000 gallons or 1,000 $m^3$) were released to the ocean surface under adverse weather conditions with no cleanup response, the trajectory analyses show the potential for oiling of the coastline on the mainland from Carpenteria south to Point Fermin near San Pedro after approximately 72 hours. Under Santa Ana wind conditions, the shorelines of Anacapa, Santa Cruz, and Santa Rosa Islands could be oiled (BHPB 2004). However, with proper spill response, the consequence analysis shows that there are no scenarios in which the spilled oil would reach any shoreline.

The LNG carriers and attending vessels would be powered by natural gas, thereby reducing the risk of a spill of diesel fuel, and minimizing impacts on the marine environment from atmospheric deposition of pollutants from emissions from these vessels. The LNG carriers would be equipped with a dual mode fuel system for the main propulsion and auxiliary systems. When on approach or departure to the FSRU or when moored, the LNG carriers would run exclusively on natural gas. The fuel oil would be used for the trans-ocean voyages for fuel economy and speed of transit. The Applicant has not finalized the design specifications for the LNG carriers and cannot estimate the diesel storage capacity at this time; however, all discharges from construction vessels, the FSRU, and tug/supply vessels would be governed by the facility's NPDES permit. Each of these water uses and discharges is described in more detail in Sections 2.2.2.3, "LNG Receiving, Storage, and Regasification Facilities," 2.2.2.4, "Utilities Systems and Waste Management," 2.2.2.5, "Safety Systems," and 2.2.2.6, "Other Operations."

Seabirds, especially diving birds, are extremely vulnerable to oil and fuel spills. Oil clogs the fine strands of the feathers, which shed water and trap air for insulation (Holmes and Chronshaw 1977). Once this occurs, the metabolic rate increases, the fat reserves are expended and progressively more energy is consumed, resulting in death (Hartung 1967; Croxall 1977). Also, once the feathers are fouled, buoyancy is reduced, resulting in even greater expenditures of energy (Briggs et al. 1997). Oiled seabirds generally preen, ingesting oil in the process. Aliphatic compounds may concentrate in the liver, resulting in adverse behavioral effects (Kuletz 1997). Numerous inflammatory and toxic impacts on internal organs can be manifested (Leighton 1991). Oil in the gastrointestinal system can result in limited absorption of nutrients (Briggs et al. 1997).

Natural Gas Leak

LNG is natural gas in its liquid form. LNG is neither corrosive nor toxic. Natural gas is primarily methane, with low concentrations of other hydrocarbons, water, carbon dioxide, nitrogen, oxygen and some sulfur compounds. However, during the process known as liquefaction, natural gas is cooled below its boiling point, removing most of these compounds. The remaining natural gas is primarily methane with only small amounts of other hydrocarbons (California Energy Commission 2005).

The estimated risk of an offshore pipeline rupture is “rare” (four serious injuries per 100,000 pipeline miles [160,900 km] per year or approximately one fatality per 100,000 pipeline miles [160,900 km] per year). See Section 4.2, “Public Safety: Hazards and Risk Analysis,” for a detailed discussion of risks and dispersement of natural gas in the water column. An unplanned or accidental release of natural gas from high-pressure transmission pipelines could pose a threat to marine organisms.

Natural gas chiefly consists of saturated aliphatic hydrocarbons, i.e., methane and its homologues. Water toxicology of saturated aliphatic hydrocarbons of the methane series has not been developed and the gap cannot be filled by available materials on the toxicity of other gaseous poisons, e.g., carbon oxide, hydrogen sulfide, and ammonia, for fish. Specific effects on marine organisms of each of these gases in the water environment do not allow us to extrapolate these data to predict the biological effects of methane and other saturated hydrocarbons (Patin 1993).

A leak in the subsea pipelines that released natural gas into the ocean could impact marine organisms, depending on the location and volume of the release. Odorized natural gas could be released in a high-pressure jet into the surrounding water and/or sediments. Although concentrations of natural gas could asphyxiate small aquatic organisms in the bottom sediments and seawater in the immediate vicinity of the discharge if it remained in the immediate area, neither the natural gas nor the gas odorant would be expected to remain in the bottom sediments or in the seawater for enough time to actually cause asphyxiation.

Information about the effects of methane and its homologues on marine organisms is very limited (Patin 1993). However, in the marine environment, gasses in general can rapidly penetrate into fish (especially through the gills) and disturb the main functional systems (respiration, nervous system, blood formation, enzyme activity, and others). External evidence of these disturbances includes a number of common symptoms, mainly of a behavioral nature, e.g., fish excitement, increased activity, scattering in the water. Further exposure can lead to chronic poisoning and cumulative effects can occur. These effects depend on the nature of the toxicant, exposure time, and environmental conditions (Patin 1993).

Material Safety Data Sheets (MSDSs) reviewed for natural gas provided by various manufacturers provide no data or evidence of toxicity to marine organisms. However, for safety reasons, the Applicant is proposing to add mercaptan gas (an odorant) to the natural gas on board the FSRU prior to sending it out through the subsea pipelines. Mercaptan gas, a flammable liquid with a sulfurous odor, would be added on the FSRU after the LNG is regasified. Mercaptan would be transported from Port Huneme to the FSRU along with other supplies as needed and stored in four bulk tank containers, which would be placed within secondary containment areas having a capacity of 110 percent of the storage tanks to contain spills and leaks.

Mercaptan is toxic to aquatic organisms and is readily biodegradable (according to results of a 28-day ready biodegradability test [Chevron Philips 2005]). A small release of natural gas would disperse in the water column due to the circulation patterns known to exist in the Project site and would not be expected to have a significant impact on marine organisms in the area. An accidental or unexpected large release of natural gas (and odorant) could have an impact on fish and marine organisms in the area. Data indicate that benthic ecosystems have been disturbed and their trophic structure changed in areas of methane seepage on the shelf of the North Sea and near the shore of California. Dense populations of organisms were found in bottom sediments of these areas. These microorganisms use oil and gas hydrocarbons as a food source (Patin 1993). The effects on fish in the area of the release would be similar to those discussed above. However, considering that the gas is not expected to stay in the water column, impacts are expected to be limited to a small and localized area and would not be raised to a level at or above significance criteria.

<u>LNG Spill</u>

The effects of an accidental release of LNG into the ocean water would be extremely short-term. The LNG would dissipate quickly in the atmosphere and little to no residual product would remain in the ocean habitat. For most above-water spill scenarios, LNG would quickly vaporize within minutes rather than seconds or hours of release, forming a cloud of natural gas. LNG is not toxic, but because the heavy vapor cloud tends to displace oxygen, LNG vapors pose an asphyxiation hazard. As this cloud forms, parts of the cloud would be at concentrations of natural gas that are high enough to cause asphyxiation of seabirds on the surface or flying low over the area. This potential would diminish over time as the cloud would continue to mix with ambient air, resulting in dilution of the gas. The period of time and the potential area in which asphyxiation would be a concern depends on a number of factors, e.g., the amount released and the weather and sea conditions at the time of a release. Section 4.2, “Public Safety: Hazards and Risk Analysis,” describes the modeling developed to define potential impacts above the ocean surface and to humans spill scenarios, including rapid phase transition blast forces, gas dispersion, cloud ignition, and an LNG pool or pool fire. No estimates are available for the potential subsurface pressure levels or subsea acoustic waves associated with rapid phase transition blasts or the number of individual blasts that may occur. However, it is expected that noise from blasts would have an effect on any fish, birds, or sea turtles, in the immediate area (spill scenario impacts on marine mammals discussed in Impact BioMar-8).

Section 4.2 also contains detailed specifics on an LNG release, pool spreading, physical processes in evaporation and dispersion from an LNG pool, and natural gas leaks from subsea pipelines (see Table 4.2-1 in Chapter 4.2, “Public Safety: Hazards and Risk Analysis”), as well as a complete list of potential risks and frequencies estimated for the proposed Project. The risk of a large spill (greater than 13 million gallons of LNG) happening offshore is estimated at approximately 2.4 in 1,000,000 to 6 in 10,000,000 per year. The models for large spills indicate that if a large spill were to occur, a liquid pool of LNG would form on the surface of the water. It is expected that a spill of LNG would initially (for several minutes) extend approximately tens of meters below the surface due to gravity and momentum. LNG is lighter than water and will surface almost immediately as a layer or pool of LNG on top of the water. In the worst credible case scenario spill, this LNG pool could extend to a distance of approximately 0.5 mile (0.8 km). Localized ice formation may occur at the sea surface under the LNG pool and rapid phase transition blasts may occur in certain areas of the pool. Any marine organisms, including plankton, fish, birds, sea turtles, and marine mammals coming in contact with this pool or occurring in the immediate area of a spill would most likely suffer immediate mortality. These effects are expected to be extremely short term. A pool of LNG would be expected to last no more than a few hours due to gas formation. A gas cloud could last minutes to several hours depending on environmental conditions (i.e., wind speed), continually becoming less concentrated and traveling primarily downwind of the initial spill.

Should a gas plume ignite seabirds on the surface or flying low over the area would be killed outright. Seabirds flying near the flames could suffer some singeing of feathers, compromising their ability to fly and their ability to stay warm. They could also suffer respiratory damage if superheated air were inspired. Radiated heat from an ignition, both above and near the flames, could cause a variety of problems such as overheating and exhaustion. Any organisms near the surface (such as fish) or that surfaced to breathe (such as sea turtles) in the ignition area could be burned on exposed surfaces and the respiratory passages of air-breathing organisms would be seared. The severity of such impacts would depend upon the amount of exposure received by an animal. Residual effects could include pneumonia as a result of damage to the respiratory system, as well as infection and other complications. If a catastrophic ignition were to occur, blast effects would be expected (see Section 4.2.7.3, “Physical Processes of LNG Release”).

Because the FSRU is located approximately 12.01 NM (13.83 miles or 22.25 km) offshore in waters approximately 2,900 feet (884 m) deep, it is not likely that large numbers of seabirds species would be present within areas projected in scenario modeling of a large spill of LNG. Although a certain number of fish may be impacted by a large LNG spill, however, given the predicted size of a potential LNG pool with a release of 53 million gallons (200,000 $m^3$) of LNG (0.4 NM [0.5 miles or 0.7 km] in diameter), it is not expected that a large number of fish would be impacted by such a spill. Additionally, many of the special status fish species potentially occurring in the Project site, including rockfish species and steelhead, would not be expected to occur close to the surface where these impacts could potentially occur.

Frostbite exposure limits for humans likely have little applicability to marine wildlife. Sea turtles, as reptiles, are extremely vulnerable to colder water, although the leatherback (*Dermochelys coriacea*) can tolerate a wide range of temperatures. Sudden temperature drops can cause cold stunning in turtles, a type of hypothermia in which they quickly become comatose (Spotilla 2003). Frostbite would exacerbate such situations. Seabirds, although insulated with feathers, would also be vulnerable to hypothermia and frostbite, particularly diving birds, which could become immersed in LNG or exposed to drastically cooled sea water immediately adjacent to an LNG spill.

Considering the absence of sea turtle sighting reports at or near the Project site, the fact that most sightings in the Southern California Bight are at the limits of their range (except for the leatherback sea turtle) and that sea turtle feeding habitats are not present at the Project site, it is extremely unlikely that any sea turtles would be impacted by an oil or fuel spill or LNG release.

The Applicant has incorporated the following into the proposed Project:

**AM PS-1a.** **Applicant Engineering and Project Execution Process** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**AM PS-1b.** **Class Certification and a Safety Management Certificate for the FSRU** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**AM PS-1c.** **Periodic Inspections and Surveys by Classification Societies** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**AM PS-1d.** **Designated Safety Zone and Area to be Avoided** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**AM MT-3a.** **Patrol Safety Zone** would apply to this impact (see Section 4.3, "Marine Traffic").

<u>Mitigation Measures for Impact BioMar-6: Mortality and Morbidity of Marine Biota from Spills</u>

**MM PS-1e.** **Cargo Tank Fire Survivability** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**MM PS-1f.** **Structural Component Exposure to Temperature Extremes** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**MM PS-1g.** **Pre- and Post-Operational HAZOPs** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

With the implementation of the above measures, impacts on marine biota from accidental release of natural gas from the subsea pipeline would be reduced to below the significance level. However, even with the implementation of these measures, impacts on marine biota from a large accidental release of LNG or fuel would remain significant.

**Impact BioMar-7: Discharge of Bilge Water, Gray Water, and Deck Runoff**

***An accidental discharge of untreated bilge water, gray water, or deck runoff from the FSRU or from the LNG carriers could result in the release of contaminants into the marine environment. A release of contaminants could cause mortality or morbidity of fish and/or benthic communities, and would have the potential to adversely affect special status species (CEQA Class III; NEPA moderate or major adverse, short- or long-term).***

*Construction*

An accidental release of hazardous materials (potentially contained in deck runoff), bilge water, or gray water from the construction or support vessels could have a direct impact on the marine environment and marine species. Impacts are similar to those discussed below for Operation.

*Operation*

An accidental release of hazardous materials (potentially contained in deck runoff), bilge water, or gray water from the FSRU or from the LNG carriers could have a direct impact on the marine environment and marine species. Due to their size and mobility, fish species are not likely to be directly affected by such a release. Any such release would float or disperse from the immediate spill area and would affect only a small number of individual species. The Applicant would obtain NPDES permits through the USEPA Region 9 for any regulated discharges (see Table 4.18-8 in Section 4.18, "Water Quality," for NPDES permit information). Any potential impacts from an accidental small quantity release would be short-term, adverse but less than the significance level after implementation of the proposed measures. The Applicant would treat gray water and sewage in chemical or biological sanitary waste systems pursuant to NPDES requirements before discharge. Runoff from the deck would be treated using an oil and water separator. Treating wastes and runoff before discharge would reduce the adverse impacts to less than the significance level. Additionally, the Applicant would implement the procedures detailed in the Spill Prevention, Countermeasures, and Control Plan to reduce the potential for any hazardous material spills.

Compliance with these and other regulations would reduce the possibility of a release of hazardous materials specific in this impact into the marine environment and reduce the volume of a release should an accidental release occur. Adverse impacts would be less than the significance level and no mitigation measures would be required.

**Impact BioMar-8: Release of LNG, Natural Gas, Fuel, or Oil Causes Injury or Mortality of Marine Mammals**

***A release of LNG, natural gas, fuel, or oil could cause injury or mortality of marine mammals through direct contact or ingestion of the material, and would have the potential to adversely affect special status species (CEQA Class I; NEPA major adverse, long-term).***

*Operations*

In its liquid state, natural gas can cause frostbite for any organism that comes into contact with it. If there is a major release (53 million gallons (200,000 $m^3$) of LNG) from the storage tanks on the FSRU, some LNG may extend beneath the water surface initially due to gravity until it floats to the surface because it is lighter than water. This may increase the vertical distribution of potential impacts on marine organisms from frostbite. Although LNG is stored at cryogenic temperatures, it reverts to a gaseous state upon exposure to air and water. The extent of frostbite would depend upon the actual temperature of the LNG and immediately adjacent air and water to which the organism was exposed as well as the duration of exposure. The air in the vicinity of an LNG release would cool rapidly and dramatically, but any reduction in sea surface temperature would be extremely localized and short-lived. See Section 4.2, “Public Safety: Hazards and Risk Analysis,” for a complete description of the physical processes expected to occur in the event of an LNG spill.

Marine mammals in general are much more resilient to cold water than other marine organisms, particularly larger species such as baleen whales. Some species can tolerate wide ranges of temperatures, from tropical to subpolar. Some even venture to the edges of ice floes, including California gray whales (*Eschrichtius robustus*). The thick blubber layers of baleen whales provide insulation against intense cold. Even though the vulnerability of large whale species to frostbite from LNG is unknown, effects would depend on the actual temperatures they were exposed to and the duration of the exposure. Pinnipeds and sea otters would likely be more vulnerable, if only because of their smaller body mass and thinner insulation, although several species found in this region occur from temperate to subpolar waters.

In its gaseous state, LNG would displace oxygen from the air and would act as an asphyxiant once oxygen concentrations are reduced below 18 percent. Air-breathing organisms such as marine mammals encountering a plume of natural gas can suffer oxygen deprivation when exposed to small quantities (data are not currently available on exposure limits for wildlife) and asphyxiation when breathing concentrated natural gas. The effects of oxygen deprivation from natural gas on marine mammals (when surfacing) have not been documented, but reduced diving time presumably would be a factor. The speed and endurance of such animals could also be compromised, particularly if they remained in an area where the gas was present. Other effects, such as slowing the buildup of carbon dioxide, which triggers the urge to breathe, could be lethal. Long-term effects are not known.

The extent of impacts from an LNG release depends upon a variety of factors, including the speed of release and dispersion, weather and sea conditions, which affect dispersal, the duration of the release, e.g., a slow leak versus a major tank rupture, the amount of LNG released, and the area impacted by the release. Impacts could vary from insignificant, short-lived effects to widespread impacts possibly affecting significant numbers of marine life.

In the event of a catastrophic failure to one or more LNG tanks, several events may take place. The LNG released could ignite from a variety of causes, producing a vapor cloud (flash) fire with an average height ranging from 59 feet (18 m) up to 98 feet (30 m), depending upon various factors. Maximum vertical height of a flash fire is approximately 197 feet (60 m). This (flash) fire could range from a radius of 3.5 to 6.5 NM (4 to 7.5 miles or 6.5 to 12 km). Marine mammals and sea turtles caught on the surface in the (flash) fire probably would not survive unless they descended instantly and were able to move well beyond the radius. They could also suffer other effects, including damage to the skin and respiratory system. In the event that such a release of LNG did not ignite, any marine mammal surfacing within the concentrated radius would likely be asphyxiated as well as probably suffer from frostbite or hypothermia. Any marine mammals in the impacted area would likely (depending on the severity of injuries) suffer mortality.

The effects of hydrocarbon exposure on marine mammals have been somewhat better documented. Petroleum-based products include a broad range of natural hydrocarbon-based substances and refined petroleum products, each having a different chemical composition. As a result, each type of refined product has distinct physical properties that affect the way oil spreads and breaks down, the hazard it may pose to marine and human life, and the likelihood that it will pose a threat to natural and man-made resources. For example, light refined products, such as gasoline and kerosene, spread on water surfaces and penetrate porous soils quickly. Fire and toxic hazards are high, but the products evaporate quickly and leave little residue. Alternatively, heavier refined oil products may pose a lesser fire and toxic hazard and do not spread on water as readily.

The rate at which an oil spill spreads will determine its effect on the environment. Most oils tend to spread horizontally into a smooth and slippery surface (or slick), on top of the water. Factors which affect the ability of an oil spill to spread include surface tension, specific gravity, and viscosity. In general, refined petroleum products tend to be more toxic to organisms but less persistent in the environment. Crude oils and heavy fuel oils like bunker fuels tend to be less toxic but are more persistent and more likely to have physical impacts on wildlife e.g. coating feather, fur and skin. Crude oil would not be used as part of the proposed Project; however, other hydrocarbon products would be used.

Effects on wildlife vary from species to species and with various hydrocarbon compounds. Odontocetes exposed to petroleum products sometimes exhibit mild cellular necrosis of the skin (Geraci and St. Aubin 1982; Engelhardt 1983). However, no cetacean mortalities were noted following the 1969 oil spill at Union Oil Company's (now Unocal) Platform A, off Santa Barbara, although the spill occurred during the northbound migration of California gray whales (Brownell 1971). California sea lions and northern elephant seals did not suffer mortality either (Brownell and Le Boeuf 1971; Le Boeuf 1971). Sea otters coated with oil or petroleum products can die from hypothermia because the oil mats the fur, compromising the ability of the dense pillage to trap air for insulation (Costa and Kooman 1982; Engelhardt 1983; Lipscomb et al. 1993). The trapped air also provides some buoyancy so oiled animals expend more energy remaining afloat.

Pinniped pups are born without blubber layers and rely instead upon their dense natal coats for insulation. They are vulnerable to oil deposits on their coat until they acquire a blubber layer. Pinniped pups stay at rookery areas and in the immediate nearshore waters for a few to several weeks, however; therefore, a large-scale oil or fuel spill would have to spread to the rookery areas to impact the pups. The nearest pinniped rookery to the Project site is at Mugu Lagoon. In addition, small numbers of harbor seals are born at Anacapa Island. The effects of petroleum compounds on the coats of juvenile and adult pinnipeds appear less deleterious because they retain a blubber layer for insulation. Fur seals, however, rely upon air trapped in their coat as well as on blubber for insulation and so may remain vulnerable to oiling. Emaciated specimens would likely be more vulnerable to oiling. Also, like sea otters, fur seals rely on air trapped in the fur to provide buoyancy.

Ingestion of hydrocarbon compounds can occur when a marine mammal breathes in volatile elements or swallows some oil. The liver and blubber tend to accumulate the highest concentrations of hydrocarbons. These substances may be released from the blubber during lactation, which may affect the young at crucial growth stages. Nonetheless, little is known about the clinical or pathological effects of oil on pinnipeds and cetaceans. Most have not died after exposure to such substances (Moeller 2003). The literature is replete with cautions against assuming a cause-and-effect relationship between exposure of marine mammals to hydrocarbons and other potentially toxic substances; contaminant levels in tissues do not necessarily equate to contaminate toxicity (Reddy and Ridgway 2003). The greatest difficulty lies in obtaining sufficiently large sample sizes from both healthy and moribund specimens. (Stein et al. 2003).

Materials stored on the FSRU are unlikely to be released into the marine environment because they would be stored in U.S. Department of Transportation-approved containers within secondary containment and would be protected within the double hull of the FSRU. The USCG would have jurisdiction over response and cleanup operations.

<u>Natural Gas Leak</u>

The estimated risk of an offshore pipeline rupture is “low”. See Section 4.2, “Public Safety: Hazards and Risk Analysis,” for a detailed discussion of risks. An unplanned or accidental release of natural gas from high-pressure transmission pipelines could pose a threat to marine mammals, depending on the location and volume of the release.

Natural gas MSDSs provided by various manufacturers were reviewed. They provide no data or evidence of toxicity to marine organisms. However, for safety reasons, the Applicant is proposing to add an odorant to the natural gas on board the FSRU prior to sending it out through the subsea pipelines. The odorant gas would be tert-butylmercaptan (Spotleak 1039). The MSDS indicates that this material is moderately toxic to *Daphnia magna* (48-hr ED50 6.7 mg/l) and slightly toxic to rainbow trout (96-hr LC50 34 mg/l) and alga (72 hr EC50 13 mg/l). However, data was not available to determine impacts of the odorized natural gas to whales from an accidental large release. A small release of natural gas would immediately disperse in the water column due to the circulation patterns known to exist in the Project site and would not be expected to have a significant impact on marine mammals in the area. Impacts are expected to be limited to a small and localized area and would not be raised to a level at or above significance criteria.

The Applicant has incorporated the following into the proposed Project:

**AM PS-1a.** **Applicant Engineering and Project Execution Process** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**AM PS-1b.** **Class Certification and a Safety Management Certificate for the FSRU** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**AM PS-1c.** **Periodic Inspections and Surveys by Classification Societies** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**AM PS-1d.** **Designated Safety Zone and Area to be Avoided** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**AM MT-3a.** **Patrol Safety Zone** would apply to this impact (see Section 4.3, "Marine Traffic").

<u>Mitigation Measures for Impact BioMar-8: Release of LNG, Natural Gas, Fuel, or Oil Causes Injury or Mortality of Marine Mammals</u>

**MM PS-1e.** **Cargo Tank Fire Survivability** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**MM PS-1f.** **Structural Component Exposure to Temperature Extremes** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**MM PS-1g.** **Pre- and Post-Operational HAZOPs** would apply to this impact (see Section 4.2, "Public Safety: Hazards and Risk Analysis").

**MM MT-3f. Live Radar and Visual Watch** would apply to this impact (see Section 4.3, "Marine Traffic").

Although compliance with these measures would reduce the potential for impacts on marine mammals, an accidental large spill of LNG could possibly result in impacts on migrating whales during migration periods. Impacts on marine mammals resulting from release of LNG, natural gas, fuel, or oil would remain potentially significant even with the implementation of the above measures.

**Impact BioMar-9: Collision between Project Vessels and Marine Mammals or Sea Turtles**

***Construction and operational vessels could collide with marine mammals or sea turtles or other special status species resting on the ocean surface, resulting in injury or mortality (CEQA Class III; NEPA moderate or major adverse, short- or long-term).***

*Construction*

Section 4.3, "Marine Traffic," provides a detailed description of the marine vessels expected to be used during construction activities for and operation of the proposed Project. Two anchor-handling tug supply vessels (15,000 horsepower [hp]) would tow the FSRU from the fabrication site to the mooring location. Two barges would transport anchors and equipment to the mooring location, and two supply vessels would transport materials and crew. Mooring installation would occur over a 24-day period 12 hours per day.

*Operation*

Most collisions involving small cetaceans, pinnipeds, sea otters, and sea turtles involve small, fast vessels (Cordaro 2002). In small craft, the noise source and dangerous parts of the vessel are essentially in the same place. The shaft, strut, and rudder—or outdrive—and the propeller are at or near the stern, but the bow is not far away.

Collisions with large whales usually involve ships rather than small craft. Modern merchant vessels, including LNG carriers, have a bulbous bow section that protrudes forward underwater. On a few occasions, merchant vessels have entered ports, including Los Angeles-Long Beach, with dead whales draped over the bulbous bow section (Cordaro 2002). In other cases, dead whales showing slashes from large propellers have drifted ashore (Woodhouse 1996).

The primary noise source of an approaching ship may not be close enough to warn a whale of an approaching vessel. The bulbous bow virtually eliminates the bow wake, producing greater speed and efficiency. Because the wake is almost nonexistent, noise is also reduced, rendering the bow of the ship very quiet, particularly if ambient sounds such as whitecaps mask sounds from the bow. The propeller(s) and engines are located toward the stern, so the primary source of noise is far removed from the bow. LNG carriers range up to 950 feet (290 m) in length (slightly longer than the FSRU).

Considering the length of LNG carriers, this means that the primary noise source is some distance from the bow. Large LNG carriers in use today carry up to 4.89 million cubic feet (138,500 $m^3$) of LNG. A vessel capable of carrying 5.42 million cubic feet (153,500 $m^3$) would be launched in 2005, and others are being designed with capacities of up to 8.8 million cubic feet (249,200 $m^3$) (Maritime Reporter and Engineering News 2004). Such vessels will be substantially longer; thus, the primary noise source will be even further removed from the bow.

During normal operations, the FSRU would receive LNG carriers two to three times per week, weather permitting; therefore, there would be between 104 and 156 LNG carrier visits at the port annually. Considering the size of modern ships in general, whales may not perceive the danger of a swiftly approaching ship. Moreover, modern ships are very fast. Most LNG carriers have design speeds ranging from 19.5 to 21 knots (22.4 to 24.2 miles per hour) (Maritime Reporter and Engineering News 2004), and other modern ships are generally as fast and sometimes even faster.

Ship strikes involving marine mammals and sea turtles, although uncommon, have been documented for the following listed species in the eastern North Pacific: blue whale, fin whale, humpback whale, sperm whale, southern sea otter, loggerhead sea turtle, green sea turtle, olive ridley sea turtle, and leatherback sea turtle (NOAA Fisheries and USFWS 1998a, 1998b, 1998c, 1998d; Stinson 1984; Carretta et al. 2001):

Ship strikes have also been documented involving gray, minke, and killer whales. Collisions with sei, Bryde’s, and North Pacific right whales may have occurred in the eastern Pacific, but have not been reported (Carretta et al. 2001; Angliss et al. 2001). Very few ship strikes involving pinnipeds have been reported over the past 28 years by the Santa Barbara Marine Mammal Center (1976–2004). No sea turtle-ship strikes have been reported in the area, although an olive ridley sea turtle stranded in Santa Barbara in 2003 showed signs of blunt force trauma consistent with a vessel strike (Santa Barbara Marine Mammal Center 1976–2004). No collisions have been reported between any oil supply or crew vessels and any cetaceans or sea turtles in the region (Cordaro 2002), although an oil supply vessel struck and presumably killed an adult male northern elephant seal in the Santa Barbara Channel in June 1999 (Minerals Management Service 2001).

Determining the cause of death for marine mammals and sea turtles that wash ashore dead or are found adrift is not always possible, nor is it always possible to determine whether propeller slashes were inflicted before or after death. In the case of the sea otter, wounds originally thought to represent propeller slashes were determined to have been inflicted by great white sharks (*Carcharodon carcharias*) (Ames and Morejohn 1980). In general, dead specimens of marine mammals and sea turtles showing injuries consistent with vessel strikes are not common.

Considering the level of vessel traffic in the region and the paucity of reported vessel strikes or other evidence, it is possible but unlikely that a collision would occur between a Project vessel and a marine mammal or sea turtle. Watches are maintained while vessels are under way. Prudent seamanship includes avoiding all large objects in the path of a vessel, including whales. In the unlikely event that such an impact occurred, it would be considered either a Level A harassment or a Level B harassment under the MMPA, depending on whether the animal were injured or not.

The Applicant has incorporated the following into the proposed Project:

**AM BioMar-9a. Avoid Offshore Construction During Gray Whale Migration Season.** The Applicant would conduct offshore construction activities outside the gray whale migration season (June 1 through November 30).

**AM BioMar-9b. Marine Mammal Monitoring**. All construction vessels would carry two qualified marine monitors and all operational vessels would carry one qualified marine monitor to provide a 360-degree view and watch for and alert vessel crews of the presence of marine mammals and sea turtles during construction activities. Additionally, the following actions would be implemented, and the following information would be made available to all vessel operators associated with the Project and posted in the pilot house:

- The monitors would receive training from a qualified independent marine wildlife mitigation firm approved in advance by NOAA Fisheries and USFWS, in consultation with the CDFG. The training would enable monitors to identify marine mammal and sea turtle species and to understand their behaviors, seasonal migrations, and the importance of avoiding them.
- All monitors would be familiar with the mitigation measures described in the Marine Mammal Monitoring Protocol and in the Final EIS/EIR for the Project and would have a copy of these measures during monitoring. These measures spell out the specific responsibilities of the monitors and Project personnel.
- Monitors would have the authority to stop work until monitors determine there is no longer a threat and/or the animal(s) transits the area if a marine mammal or sea turtle approaches the 100-yard (91.4 m) safety zone or the monitors determine that the Project operations have the potential to threaten the health or safety of marine wildlife or “take” a protected species as defined by regulations implementing the ESA and MMPA.
- While on watch, monitors would have no other duty than to observe marine mammals and sea turtles. Monitors would be on duty 24 hours a day unless the vessel is in harbor or anchorage. Watches would be divided according to the ships’ schedules, but in no event would a monitor stand a total of more than 12 hours of watches during any 24-hour period. The Applicant may engage trained third-party observers, may utilize

trained crew members, or may use a combination of both third-party and crew observers. During observations, monitors would follow the guidelines in MMS Notice to Lessees NTL No. 2004-G01 for visual observers regarding scheduled time on and off duty while engaged as a monitor, not to exceed more than four consecutive hours on watch as an observer.

- Monitoring would be conducted during all construction activities and as each vessel travels to and from the construction site. Supply, support, and crew vessels traveling to and from the Project site during operation also would be monitored. The Applicant would meet the same requirements as other marine vessels during operations.
- Each monitor would maintain watch for marine mammals and sea turtles at all times while each vessel is under way. If any whales are observed, the monitor would request the vessel operator to employ the following procedures:
  - Do not approach whales or any threatened or endangered wildlife closer than 1,000 feet (305 m).
  - Approach whales from the side or rear on a parallel course.
  - Do not cross directly in front of the whales.
  - Maintain the same speed as the whales.
  - Do not attempt to herd or drive any whales.
  - If a whale exhibits evasive or defensive behavior, stop the vessel until the whale has left the immediate area.
  - Do not come between or separate a mother and its calf.

  In addition, qualified independent monitors, approved in advance by NOAA Fisheries and the USFWS in consultation with the CDFG, would be aboard the pipelaying vessel while it is deployed at the Project site. The monitors would:
  - Establish and maintain communications with the vessel operator at all times.
  - Be positioned so that a 360-degree view is maintained.
  - Be on watch during all pipelaying operations, day or night.
  - Use night vision or low-light binoculars in reduced light.
  - If a collision appears likely, reduce the speed of the vessel as quickly and as much as possible and engage propulsion machinery only when necessary to maintain position.
  - If a collision is likely, take up observation position and require available crew aboard the ship to take up

observation positions to help report sightings to the monitor so that appropriate actions can be taken to avoid collision.

In the unlikely event that a whale is injured, the operator would immediately notify:

- Stranding Coordinator, NOAA Fisheries, Long Beach (562-980-4017)
- Enforcement Dispatch Desk, CDFG, Long Beach (562-590-5133)
- Environmental Planning and Management, CSLC, Sacramento (916-574-1890)
- Santa Barbara Marine Mammal Center (805-687-3255)

A detailed written report would be prepared by the monitor and dispatched to NOAA Fisheries, USFWS, the CDFG, and the CSLC. A final report summarizing the monitoring activities for the Project would also be provided to the above-mentioned agencies within 60 days of the conclusion of offshore facilities construction. Monthly reports would be prepared by the monitor summarizing marine mammal sightings and any steps taken to avoid adverse impacts.

With implementation of the Applicant measures listed above, impacts on marine mammals during migration season would be reduced to a level below the significance criteria. These measures would reduce the potential that a marine mammal or sea turtle would be injured or harassed by Project vessels during construction or operational activities.

**Impact BioMar-10: Entanglement of Marine Mammals, Sea Turtles and Other Special Status Species.**

***Marine mammals or sea turtles or other special status species could become entangled in construction or operation equipment, causing injury or mortality, (CEQA Class II; NEPA moderate or major adverse, short- or long-term)***

*Construction*

During construction, divers would help align the HDB pipelines coming out from shore to the offshore pipelines so that they can be connected. In the course of such operations, dive support vessels and perhaps a dive barge would be moored over the HDB pipelines where they emerge from the seafloor in approximately 40 feet (12.2 m) of water depth. Associated mooring lines, as well as down lines, divers' air hoses, marker buoy lines, and other lines pose a risk of entanglement for marine mammals and sea turtles. However, due to the size of the proposed offshore mooring system anchor cables, impacts from entanglement in these cables are not anticipated.

Numerous marine mammal entanglements in synthetic materials have been documented on the West Coast. The most common entanglement is in various fishing nets or lines (Cordaro 2002; Santa Barbara Marine Mammal Center 1976-2004). Entanglements in moorings, crab and lobster trap float lines, and mariculture buoys also have been reported (Cordaro 2002.; Knowlton 2002; Santa Barbara Marine Mammal Center 1976–2004). In numerous past projects in the region, monitors have been deployed to observe dive operations associated with pipelaying and repairs, HDB activities, and similar operations. The methodology has been successful, with no adverse impacts on marine mammals and sea turtles (Woodhouse and Howorth 1992; Howorth 1995, 1998b, 1998c, 1998d, 1999a, 1999b, 2000, 2001a, 2002e, 2001c; 2002a, 2001d, 2001e, 2001f; ).

The Applicant has incorporated the following into the proposed Project:

**AM BioMar-9b.** **Marine Mammal Monitoring** would apply to this impact.

<u>Mitigation Measures for Impact BioMar-10: Entanglement of Marine Mammals or Sea Turtles</u>

**MM BioMar-10a.** **Deployment of Potentially Entangling Material.** The Applicant shall ensure that the vessel operator deploys any material that has the potential for entangling marine mammals or sea turtles only for as long as necessary to perform its task, and then immediately removes such material from the Project site. Possible slack shall be taken out of any material that could cause entanglement unless such slack is necessary to allow for currents, tides, and other factors. In the unlikely event that an entanglement appears likely, the marine mammal monitor shall request the operator to remove all material that could cause entanglement, if possible, and to take up as much slack as possible in material that cannot be immediately removed. Temporary mooring buoys shall be positioned with heavy steel cables or chains to minimize potential entanglements. Mooring lines shall be used only when vessels are moored and shall not be left on mooring buoys when not in use.

**MM BioMar-10b.** **Notification.** In the unlikely event that a marine mammal or sea turtle is entangled, the Applicant shall require the vessel operator to immediately notify the stranding coordinator at NOAA Fisheries in Long Beach (562-980-4017) and the Santa Barbara Marine Mammal Center (805-687-3255) so that a rescue effort may be initiated.

Implementation of these mitigation measures would reduce impacts on marine mammals to a level below the significance criteria by reducing the amount of potentially entangling material in the water column and by providing monitors to observe activities, thus reducing the possibility of a marine mammal or sea turtle becoming entangled.

**Impact BioMar-11: Discharge of Ballast Water Potentially Containing Exotic Species**

***A release of ballast water containing exotic species could introduce exotic species that directly compete with native organisms, affecting the viability of native species, including special status species (CEQA Class III; NEPA moderate or major adverse, short- or long-term).***

*Construction*

Before initial arrival of the FSRU from the overseas fabrication port, the FSRU would follow established ballast water exchange protocol in accordance with MARPOL, State, and USCG requirements, including notification and exchange of ballast water outside the 200 NM (230 miles or 371 km]) EEZ limit, and potential impacts would be adverse, but less than the significance level.

*Operation*

During normal FSRU operations, the key management criterion for ballast water is that the FSRU would be operated at nearly constant draft (depth). Any LNG inventory changes would need to be offset by ballast water pumping. Under normal production rates, the required intake volumes would be approximately 15,000 to 20,000 metric tons (15 million to 20 million kilograms [kg]) of ballast per day. Considering that a typical 4.9 million cubic foot (138,800 $m^3$) LNG cargo is taken onboard over a 24-hour period while the LNG carrier continues to send gas to shore over that same 24-hour period, the net amount of ballast taken onboard over that 24-hour period would be approximately 50,000 to 55,000 metric tons (50 million to 55 million kg). Ballast water would be obtained on site and would not be chemically treated prior to release.

Ballast water from LNG carriers would be exchanged outside the 200 NM (230 miles or 371 km) limit according to regulations. While offloading the LNG cargo, the carriers would pump ballast water into their tanks to compensate for the weight of LNG being discharged to the FSRU. Any discharges would be conducted in compliance with all applicable Federal and State regulations and routine ballast water exchanges during operation of the FSRU would contain only water obtained on site. The FSRU (prior to installation) and LNG carriers (at all times) would exchange ballast water outside the 200 NM (230 miles or 371 km) limit, in compliance with Federal and State requirements. No exotic species would be discharged at the site of the FSRU; therefore, no significant impacts on the marine environment or directly on marine biota are anticipated, and no mitigation measures would be required.

**Impact BioMar-12: Increase/Decrease in Fish Abundance or Commercially Important Benthic Species.**

***Commercially important fish species could potentially avoid the Project site due to increased human activity and Project-related noise. Additionally, fish and other benthic species could be attracted to the low relief habitat provided by the subsea pipeline, decreasing abundance in other heavily fished areas (CEQA Class III; NEPA moderate or major or adverse or beneficial, short- or long-term).***

*Construction*

It is expected that most species of fish would temporarily avoid the construction areas near the pipeline and mooring point during construction activities due to disturbances of the sediment and to noise. These marine species would quickly return to the area once construction activities and noise subside and any impacts would be temporary and would be adverse but below its significance criteria.

*Operations*

For safety purposes, a 1,640-foot (500 m) safety zone surrounding the FSRU would be enforced. The exclusion of fisherman from fishing grounds in the safety zone could increase fish abundance within the safety zone. Additionally, fishing pressure could increase in areas where fishing is not precluded, resulting in a decrease in fish abundance in areas outside the safety zone. The FSRU would not be an undersea or stationary structure like a platform, but instead would float and "weathervane" around its mooring point.

The FSRU and pipeline route would traverse three CDFG (2004) catch blocks: Blocks 683, 705, and 682 (see Figure 4.16-1 in Section 4.16, "Socioeconomics"), which are much larger than the area affected by the Project. The 1,640-foot (500 m) safety zone would eliminate 0.23 square NM (0.3 $mi^2$ or 0.8 $km^2$) of commercial fishing in Block 705. This equates to 0.23 percent of the available 100 $mi^2$ (259 $km^2$) found within the block. Because fishing gear types used in the block are mainly oriented toward pelagic species, it is predicted that the fishers would not be significantly affected nor landings reduced. The safety zone around the FSRU, compared to the overall size of fishing areas surrounding the proposed Project, would not have an impact on commercial fishing or on the abundance of commercially important species.

Approximately 17.1 miles (27.5 km) of the 22.77-mile (36.64 km) pipeline would traverse areas designated as trawl fishing grounds. No permanent exclusion of trawl fishers from fishing grounds directly along the pipeline route would occur during operation. Although the temporary exclusion of fishers from fishing grounds directly along the pipeline route may occur during construction, the overall economic impacts would not exceed the significance criteria.

Due to the mobility of fish species and the relatively small size of the Safety Zone, a significant increase in fish congregation in the immediate area surrounding the FSRU and subsea pipeline is not expected and thus would not affect fishing pressure or catch abundance.

Rapid recolonization of fish and benthic species would be expected around the pipeline and mooring points following construction activities; therefore, this impact is less than the significance criteria and no mitigation measures would be required.

Impacts and mitigation measures associated with marine biology are summarized in Table 4.7-14.

**Table 4.7-14 Summary of Marine Biology Impacts and Mitigation Measures**

| Impact | Mitigation Measure(s) |
|---|---|
| **Impact BioMar-1:** *Burial of Sessile Marine Biota*<br>Construction activities associated with pipeline and mooring installation could temporarily disturb soft substrate sediments and could bury or crush sessile marine biota such as benthic invertebrates (CEQA Class III; NEPA minor adverse, short-term). | None. |
| **Impact BioMar-2:** *Temporary Avoidance of the Area Due to Increased Turbidity from Construction Activities Offshore or Accidental HDB Release of Drilling Fluids*<br>A release of drilling fluids and bentonite into the subtidal environment during HDB could temporarily increase turbidity. Increases in turbidity at the offshore exit point could cause fish to avoid this area (CEQA Class II; NEPA minor adverse, short-term). | **MM WAT-3a. Drilling Fluid Release Monitoring Plan** (see Section 4.18, "Water Quality and Sediments," and Appendix D1). |
| **Impact BioMar-3:** *Temporary or Permanent Alteration or Disturbance of Marine Biota or Sensitive Habitats, including EFH*<br>Construction and/or operational activities could affect marine biota or alter EFH or sensitive habitats (beach spawning areas or hard bottom substrate), resulting in cessation or reduction of feeding or reproduction, area avoidance, or changes in migration patterns for both non-threatened and endangered and special status species (CEQA Class II; NEPA moderate or major adverse, short- or long-term). | **AM BioMar-3a. Construction/Operations Lighting Control.** A plan would be developed in consultation with a marine bird expert and submitted for approval by the USCG and the CSLC at least 60 days prior to construction.<br>**AM NOI-4a**. **Construction Noise Reduction Measures** (see Section 4.14, "Noise and Vibration").<br>**MM BioMar-3b. Monitoring**. If intertidal beach work occurs between February and September, the Applicant shall ensure that a qualified biologist will monitor the beach within 100 feet (30.5 m) of the route during the two weeks prior to installation. If a grunion spawning event occurs during the two weeks prior to construction activities, installation will be delayed until the grunion eggs have hatched. A qualified biologist shall determine the day in which construction can begin again after the spawning event.<br>**MM BioMar-3c**. **Avoidance**. The Applicant shall ensure that any unexpected hard bottom habitats encountered during construction will be avoided.<br>**MM NOI-1a. Efficient Equipment Usage** (see Section 4.14, "Noise and Vibration"). |

**Table 4.7-14 Summary of Marine Biology Impacts and Mitigation Measures**

| Impact | Mitigation Measure(s) |
|---|---|
| **Impact BioMar-4:** *Construction or Operation Vessels Act as an Attractive Nuisance or Disrupt Marine Mammal Behavior or Migrations*<br>Construction or operational activities could alter sensitive habitats such that marine mammal reproduction could be reduced, prey species could be eliminated, or animals might avoid an area (CEQA Class III; NEPA moderate or major adverse, short- or long-term). | None. |
| **Impact BioMar-5:** *Noise Disrupting Marine Mammal Behavior*<br>Noise from construction and operation vessels or equipment could disrupt migrations; interfere with or mask communications, prey and predator detection, and/or navigation; cause adverse behavioral changes; or result in temporary or permanent hearing loss (CEQA Class I; NEPA major adverse, long-term). | **AM BioMar-9a**. **Avoid Offshore Construction during Gray Whale Migration Season**.<br>**AM BioMar-9b**. **Marine Mammal Monitoring**.<br>**MM BioMar-5a. Noise Reduction Design.** The Applicant shall work with marine architects, acoustic experts and mechanical engineers and the USCG, among others, to design the FSRU and its equipment to reduce, to the maximum extent feasible, the output of cumulative noise from the facility.<br>**MM BioMar-5b**. **Acoustic Monitoring Plan.** The Applicant shall prepare an acoustic monitoring plan to obtain site-specific baseline data and empirical data prior to and during LNG operations.<br>**MM BioMar-5c. Helicopter Altitude**. The Applicant shall ensure that helicopters maintain a flight altitude of at least 2,500 feet (762 m), except during takeoff and landing.<br>**MM NOI-1a. Efficient Equipment Usage** (see Section 4.14, "Noise and Vibration"). |
| **Impact BioMar-6:** *Mortality and Morbidity of Marine Biota from Spills*<br>Although rare, an accidental release of a significant amount of oil or fuel during construction or operation, or LNG spills or a natural gas leak from subsea pipelines, could cause morbidity or mortality of marine biota, including fish, invertebrates, seabirds, and special status species such as sea turtles, through direct contact or ingestion of the material (CEQA Class I; NEPA major adverse, long-term). | **AM PS-1a. Applicant Engineering and Project Execution Process** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**AM PS-1b. Class Certification and a Safety Management Certificate for the FSRU** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**AM PS-1c. Periodic Inspections and Surveys by Classification Societies** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**AM PS-1d. Designated Safety Zone and Area to be Avoided** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**AM MT-3a. Patrol Safety Zone** (see Section 4.3, "Marine Traffic").<br>**MM PS-1e. Cargo Tank Fire Survivability** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**MM PS-1f. Structural Component Exposure to Temperature Extremes** (see Section 4.2, "Public Safety: Hazards and Risk Analysis"). |

**Table 4.7-14 Summary of Marine Biology Impacts and Mitigation Measures**

| Impact | Mitigation Measure(s) |
|---|---|
| | **MM PS-1g. Pre- and Post-Operational HAZOPs** (see Section 4.2, "Public Safety: Hazards and Risk Analysis"). |
| **Impact BioMar-7:** *Discharge of Bilge Water, Gray Water, and Deck Runoff*<br>An accidental discharge of untreated bilge water, gray water, or deck runoff from the FSRU or from the LNG carriers could result in the release of contaminants into the marine environment. A release of contaminants could cause mortality or morbidity of fish and/or benthic communities, and would have the potential to adversely affect special status species (CEQA Class III; NEPA moderate or major adverse, short- or long-term). | None. |
| **Impact BioMar-8:** *Release of LNG, Natural Gas, Fuel, or Oil Causes Injury or Mortality of Marine Mammals*<br>A release of LNG, natural gas, fuel, or oil could cause injury or mortality of marine mammals through direct contact or ingestion of the material, and would have the potential to adversely affect special status species (CEQA Class I; NEPA major adverse, long-term). | **AM PS-1a. Applicant Engineering and Project Execution Process** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**AM PS-1b. Class Certification and a Safety Management Certificate for the FSRU** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**AM PS-1c. Periodic Inspections and Surveys by Classification Societies** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**AM PS-1d. Designated Safety Zone and Area to be Avoided** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**AM MT-3a. Patrol Safety Zone** (see Section 4.3, "Marine Traffic").<br>**MM PS-1e. Cargo Tank Fire Survivability** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**MM PS-1f. Structural Component Exposure to Temperature Extremes** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**MM PS-1g. Pre- and Post-Operational HAZOPs** (see Section 4.2, "Public Safety: Hazards and Risk Analysis").<br>**MM MT-3f. Live Radar and Visual Watch** (see Section 4.3, "Marine Traffic"). |
| **Impact BioMar-9:** *Collision between Project Vessels and Marine Mammals or Sea Turtles*<br>Construction and operational vessels could collide with marine mammals or sea turtles or other special status species resting on the ocean surface, resulting in injury or mortality (CEQA Class III; NEPA moderate or major adverse, short- or long-term). | **AM BioMar-9a. Avoid Offshore Construction During Gray Whale Migration Season.** The Applicant would conduct offshore construction activities outside the gray whale migration season (June 1 through November 30).<br>**AM BioMar-9b. Marine Mammal Monitoring.** All construction vessels would carry two qualified marine monitors and all operational vessels would carry one qualified marine monitor to provide a 360-degree view and watch for and alert vessel crews of |

**Table 4.7-14 Summary of Marine Biology Impacts and Mitigation Measures**

| Impact | Mitigation Measure(s) |
|---|---|
| | the presence of marine mammals and sea turtles during construction activities. |
| **Impact BioMar-10:** *Entanglement of Marine Mammals, Sea Turtles, and Other Special Status Species*<br>Marine mammals or sea turtles or other special status species could become entangled in construction or operation equipment, causing injury or mortality (CEQA Class II; NEPA moderate or major adverse, short- or long-term). | **AM BioMar-9b. Marine Mammal Monitoring**.<br>**MM BioMar-10a. Deployment of Potentially Entangling Material.** The Applicant shall ensure that the vessel operator deploys material that has the potential for entangling marine mammals or sea turtles only as long as necessary to perform its task, and then immediately removes such material from the Project site.<br>**MM BioMar-10b. Notification**. In the unlikely event that a marine mammal or sea turtle is entangled, the Applicant shall require the vessel operator to immediately notify the stranding coordinator at NOAA Fisheries in Long Beach and the Santa Barbara Marine Mammal Center so that a rescue effort may be initiated. |
| **Impact BioMar-11:** *Discharge of Ballast Water Potentially Containing Exotic Species*<br>A release of ballast water containing exotic species could introduce exotic species that directly compete with native organisms, affecting the viability of native species, including special status species (CEQA Class III; NEPA moderate or major adverse, short- or long-term). | None. |
| **Impact BioMar-12:** *Increase/Decrease in Fish Abundance or Commercially Important Benthic Species*<br>Commercially important fish species could potentially avoid the Project site due to increased human activity and Project-related noise. Additionally, fish and other benthic species could be attracted to the low relief habitat provided by the subsea pipeline, decreasing abundance in other heavily fished areas (CEQA Class III; NEPA moderate or major adverse or beneficial, short- or long-term). | None. |

## 4.7.5 Alternatives

### 4.7.5.1 No Action Alternative

As explained in greater detail in Section 3.4.1 under the No Action Alternative, MARAD would deny the license for the Cabrillo Port Project, the Governor of California would disapprove the Project under the provisions of the DWPA, or the CSLC would deny the application for the proposed lease of State tide and submerged lands for a pipeline right-of-way. Any of these actions or disapproval by any other permitting agency could result in the Project not proceeding. The No Action Alternative means that the Project would not go forward and the FSRU, associated subsea pipelines, and onshore pipelines and related facilities would not be installed. Accordingly, none of the potential impacts on marine biological resources identified for the construction and operation of the proposed Project would occur.

Specifically, potential impacts that would not occur if the No Action Alternative is implemented include the following:

- Crushing or burial of sessile marine biota by construction activities, resuspended sediments and a potential release of 10,000 gal of bentonite;
- Avoidance of construction area by marine fish species due to increased turbidity and a potential release of 10,000 gal of bentonite;
- Temporary or permanent alteration of marine biota and sensitive habitats during construction and operation including impacts on EFH, impacts associated with noise and lighting, impingement and entrainment of an estimated average of 42,704 eggs and 7,614 larvae per day from baseline populations within the source water body estimated at 21.5 trillion eggs and 3.8 trillion larvae, effects from cooling water discharges that would be up to 20°F (11°C) different than ambient, and loss of an estimated 85,490 zooplankton per day;
- Attraction of marine biota to construction or operation vessels or disruption of marine mammal behavior or migration;
- Noise impacts on marine mammals that exceed Level A take thresholds for two out of seven operating scenarios and Level B take thresholds for all operating scenarios;
- Mortality and morbidity of marine biota from accidental oil, fuel, natural gas or LNG spills;
- Impacts on marine biota from discharge of bilge water, grey water and deck runoff;
- Mortality and morbidity of marine mammals from accidental oil, fuel, natural gas or LNG spills;
- Vessel strikes involving Project vessels during construction resulting in injury or mortality of sea turtles and marine mammals;
- Potential entanglement of sea turtles and marine mammals in construction or operation equipment;
- Exotic species that could compete with native species would not be introduced in ballast water; and
- Fish species would not be attracted to the Project site by human activity, or to the low relief habitat provided by the subsea pipeline.

Since the proposed Project is privately funded, it is unknown whether the Applicant would proceed with another energy project in California; however, should the No Action Alternative be selected, the energy needs identified in Section 1.2, "Project Purpose, Need and Objectives," would likely be addressed through other means, such as through other LNG or natural gas-related pipeline projects. Such proposed projects may result in potential impacts on marine biological resources similar in nature and magnitude to the proposed Project as well as impacts particular to the respective configurations and operations of each project; however, such impacts cannot be predicted with any certainty at this time.

#### 4.7.5.2 Alternative DWP – Santa Barbara Channel/Mandalay Shore Crossing/ Gonzales Road Pipeline

The pipeline route beginning at Platform Gilda and ending at the proposed HDB exit point offshore and the shore crossing at the Reliant Energy Mandalay Generating Station would follow an existing pipeline right-of-way.

If this alternative were implemented, the FSRU would be located 12.01 NM (13.83 miles or 22.25 km) from the CINMS. In comparison, the proposed Project would place the FSRU approximately 12.71 NM (14.6 miles or 23.6 km) from the CINMS. Siting the FSRU in the Santa Barbara Channel would likely result in greater impacts on marine resources, in comparison with the impacts from the proposed Project. The pipeline route for this site would extend across what is known locally as Ventura Flats, a broad alluvium consisting of sedimentary deposits. This broad plain is a productive area for California halibut and other soft-bottom organisms.

This area is an important feeding ground for California sea lions and Pacific harbor seals, which frequent the area year-round. Sea otter sightings along this stretch of coast are presently rare. Coastal bottlenose dolphins inhabit the area within 0.5 NM (0.6 mile or 0.9 km) of shore year-round. California gray whales migrate through this region along several corridors. One corridor runs along the north shores and passages of the northern Channel Islands. Although this route is not within the alternative DWP location, LNG carriers would use the shipping lanes immediately adjacent to this migration corridor. Another migration corridor extends inshore from the shipping lanes, passing very near Platforms Grace and Habitat and very close to or across the proposed alternate FSRU site. Still another corridor stretches about 3.5 NM (4 miles or 6.5 km) offshore, near much of the pipeline route. Finally, a nearshore corridor extends from just beyond the surf zone to approximately 1 NM (1.2 miles or 1.9 km) offshore (Howorth 1995, 1998c, 1998d, 2001c; SAIC 2003).

Several species of oceanic dolphins occur year-round in this region, particularly long-beaked and short-beaked common dolphins and Risso's dolphins. Several other species occur during the cold-water months from late winter to late spring. The minke whale is found in the Santa Barbara Channel year-round, but never in large numbers (Howorth 1995, 1998c, 1998d, 2001c; SAIC 2003).

The escarpments along the north shores of the northern Channel Islands are frequented by blue and humpback whales (both federally endangered) from early summer though fall. These species have been reported throughout the year in the region, but in much smaller numbers. Humpbacks in particular have been observed near the alternative FSRU location, though not in concentrations. Both of these species have been reported near and in the shipping lanes. Fin whales, also endangered, have been reported only occasionally along the escarpments north of the four northern Channel Islands. Finally, North Pacific right whales have been observed twice in the Santa Barbara Channel and sperm whales have been observed on three occasions (Howorth 1995, 1998c 1998d, 2001c; SAIC 2003). Both of these species are also endangered.

All of the sea and shore bird species discussed in Sections 4.8.1, "Biological Resources – Terrestrial," occur at the Santa Barbara Channel alternative DWP site. In addition, the Ormond Beach wetland area and the Ventura River mouth just north of the pipeline shore crossing forms an important habitat for a variety of sea and migratory birds. The Ventura Flats region is an important feeding ground for the federally listed endangered California brown pelican as well as for other species of seabirds.

Potential impacts on the marine environment along the Santa Barbara Channel route from Platform Gilda to the HDB location and onshore crossing are similar to those identified for the nearshore parts within similar depths. However, the potential for impacts on marine mammals would be considerably higher than for the proposed Project due to their high concentration in the Santa Barbara Channel.

Based on the location of the proposed pipeline for the Santa Barbara Channel/Mandalay Shore Crossing/Gonzales Road Pipeline Alternative from the FSRU mooring point to Platform Gilda, it is expected that impacts on marine birds, sea turtles, benthic species, and marine fish would be similar to the impacts for the proposed pipeline route within similar depth and seafloor topography ranges. Mitigation measures for these organisms would be similar to those identified for the proposed Project.

The potential for impacts on marine mammals during construction activities may be higher at this location due to the higher concentrations of mammals in this area. Mitigation measures for potential impacts on marine mammals would include those described for the proposed Project: construction activities outside of known whale migration seasons, marine mammal monitors onboard during construction and installation activities, enforced vessel speed limits and restricted areas around the pipelaying vessel to reduce the potential for marine mammal-vessel collisions, and minimization of the use of entangling materials, and notification for rescue if a marine mammal becomes entangled

### 4.7.5.3 Alternative Onshore Pipeline Routes

Marine biology relates to offshore issues, and the Center Road Pipeline and Line 225 Loop Pipeline Alternatives relate to onshore activities only; therefore these alternatives are not analyzed here. See Section 4.8, "Biological Resources – Terrestrial."

### 4.7.5.4 Alternative Shore Crossings and Pipeline Connection Routes

**Point Mugu Shore Crossing/Casper Road Pipeline**

Offshore pipeline routes for this alternative would be the same as those identified for the proposed Project. The entire length of the pipeline from the HDB offshore exit point to the shore crossing at Point Mugu Naval Station would be installed using HDB. The nearshore seafloor and benthic habitats are the same as those discussed for the proposed Project. This alternative would have similar impacts on marine resources as the proposed Project. Mitigation measures for these organisms would be similar to those identified for the proposed Project.

**Arnold Road Shore Crossing/Arnold Road Pipeline**

Offshore pipeline routes for this alternative would be the same as those identified for the proposed Project. The entire length of the pipeline from the HDB exit point offshore to the shore crossing at Arnold Road near Ormond Beach would be installed using HDB. The nearshore seafloor and benthic habitats are the same as those discussed for the proposed Project. Mitigation measures would be similar to those identified for the proposed Project. This alternative would have similar impacts on marine resources as the proposed Project. Mitigation measures for these organisms would be similar to those identified for the proposed Project.

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